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# Maximizing the Impact of Local Police Agencies through Optimum Staffing Levels

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# Maximizing the Impact of Local Police Agencies through Optimum Staffing Levels

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## ABSTRACT

The purpose of this dissertation is to identify an optimum ratio of police officers to city residents for the purpose of reducing year-to-year crime rates in cities with populations between 25,000 and 999,999. Current research in this area focuses on the impact of the number of police officers on overall crime rates. However, that body of research does not distinguish the impacts found in minimally-staffed, moderately-staffed, and highly-staffed agencies. By examining each of these three groups separately, a statistically significant relationship was determined to exist between per capita staffing levels and short-term property crime reduction for agencies with 1.50 to 2.75 police officers per 1,000 residents. No such relationship existed for agencies with fewer than 1.50 officers or greater than 2.75 officers per 1,000 residents. There was no identifiable relationship between staffing levels and violent crime categories. As a result of this finding, an optimum staffing range has been identified for local law enforcement agencies seeking to make immediate, short-term impacts on property crime.



Keywords: Police Officer, Police Staffing, Crime Rate, Police-Citizen Ratios, Property Crime

## PREFACE

My interest in this topic stems from over two and a half decades working in law enforcement. As a young sergeant in the 1990s, I participated in accreditation inspections and experienced a top-to-bottom reorganization of the department where I worked. One thing stuck in my mind: the Department was meticulous in its attempts to comply with standardized percentage allocations on personnel. While the exact percentages have long since faded from my memory, I still vividly recall hearing the non-stop chants: No more than "x" percent of personnel should be placed in administrative positions. A minimum of "y" percent of personnel should be assigned to district patrol. In fact, the concept of percentage allocation strategies even extended to fleet management, computer equipment distribution, and other administrative arenas. The one glaring void that has baffled me ever since was that nobody ever examined the gross totals from which those percentages should be defined. Are those strategies designed for allocation of personnel based on whatever number of officers the agency happens to have, the number of officers the agency wants to have, or the number of officers the agency should ideally have? In other words, nobody looked beyond the nationally recommended percentages to ask, "Percentages of what?" That early experience highlighted for me the lack of macro-level staffing guidance for police administrators. How can a useful percentage-based staffing pattern be identified if nobody has ever determined whether the agency's overall staffing level is appropriate? As my career progressed through the ranks of lieutenant and captain, I saw this pattern repeated over and over again.

Throughout the years, numerous models have surfaced to help police administrators determine their ideal staffing levels. None have survived long-term, largely due to their enormous complexity. I will offer a recent example to demonstrate my point.

Wilson and Weiss (2012) recommended a performance-based approach to police staffing. They subscribed to the mantra of the International Association Chiefs of Police, which has repeatedly advised against using generic staffing models based on population. According to Wilson and Weiss, on behalf of the national Community Oriented Policing Services program, agencies should ideally use a formal community policing workload assessment model to determine appropriate staffing levels. Their model involves assessing eight different variables:

- Current staffing level
- Skill, seniority, rank, gender, and race distribution
- Functional and geographic deployment
- Compensation structure
- Generational specifics (for example, motivators for Gen X employees)
- Hiring selection and qualification processes
- Promotional processes
- Retirement options

These eight variables are then incorporated into the four conceptual elements of community policing workload assessment: assessing locality-specific definitions of the community policing model, the breadth and depth of community engagement opportunities for purposes of problem solving activities, the amount of time required to complete community policing activities, and the need to strategically engage the community in police staffing level decisions.

Wilson and Weiss state their goal is to, "Provide a practical resource to help police decision-makers understand the fundamentals of determining workforce need" (p. 3).

However, the complexity of their proposed workload assessment model makes it anything but practical.

If models like these are too complex, then how do agencies currently determine their staffing levels? Wilson and Weiss asked this question, and they found agencies tend to conduct complex staffing level assessments only when major organizational or leadership changes occur. One chief went so far as to suggest analyses were conducted when he "gets a wild hair" (Wilson and Weiss, 2012, p. 12). This Wilson and Weiss finding is consistent with Chalfin and McCrary's (2012) characterization of police agency staffing as "idiosyncratic" and largely tied to political or budgetary cycles.

On those rare occasions when an agency performs a staffing assessment, the most common method they use is the per capita (population) approach (Wilson and Weiss, 2012). The nursing profession has long used nurse-to-patient ratios to guide their staffing levels. The teaching profession relies on nationally recognized teacher-to-student ratios. But, criminal justice researchers and trade associations have inexplicably shied away from officer-to-resident ratios. Without a base ratio upon which to build, how exactly do law enforcement administrators assess their staffing using the commonly used per capita approach? Wilson and Weiss found administrators merely compared their staffing per capita with other comparable cities throughout the country. Simplicity proved to be the number one consideration for administrators facing staffing decisions.

While complex performance-based approaches are undoubtedly superior from a results standpoint, administrators did not pursue those complex methods for two simple reasons: they

could not afford to dedicate their personnel resources to complex ongoing tasks and they could not afford expensive consultants and industry researchers to conduct complex assessments on their behalf.

While consultants and industry researchers disparage the per capita technique as overly simplistic, it is difficult to escape the practical reality that this is the technique most commonly used throughout the nation. Recognizing that reality, my goal in this dissertation is to provide a more thoroughly researched per capita staffing model that will offer simplicity without relying on meaningless figures derived from a century of incrementalism. By honing in on a staffing range where incremental increases may be expected to have the greatest impact, this dissertation fulfills that goal by offering an extremely simple and practical guideline.

How important is it to have a functional per capita guideline? One only needs to open a local newspaper during an election season to see how politicians rely on promises of additional police officers for their crime fighting platforms. An excellent example is offered in a recent article, "NOPD manpower targets ignite mayoral race" (Simmerman, 2014). During the 2014 mayoral election in New Orleans, crime was at the center of both candidates' platforms, with each calling for a beefed up force of 1,600 officers from the current 1,200 officers. The article offered the following depiction:

> To some observers, 1,600 is merely a rhetorical target - a magic number designed to grab voters' attention. But the issue, perhaps the most prominent in the mayoral race, points to a larger question: Just how many cops does New Orleans need to handle a violent crime problem that remains severe and chronic [sic]? (Simmerman, 2014)

One candidate relied on a study from 1984 to achieve the 1,600 figure, but failed to account for the dramatic population shifts the city has experienced since then. Another candidate relied on a computer software program that calculated the number of officers needed to answer calls for service in the patrol districts, but did not specify how the numbers were calculated for detectives, specialized units, administrators, supervisors, and other commissioned personnel not included in the program methodology. Several experts weighed in, including one who pointed out that New Orleans was already staffed at a level comparable to most other large cities. Everyone appeared to agree on the magic 1,600 figure; but, no two people arrived at that number in the same way.

The importance of news articles such as these is to demonstrate the general perception by the public, politicians, and police administrators that more cops will lead to less crime. That widespread perception highlights the need for the simple, streamlined, and concise guidance offered by this dissertation. While the concept of per capita staffing levels examined here may appear overly simplistic to consultants and industry researchers, the practical reality is that administrators will largely ignore anything that is not simple. I believe it is better to offer a well-researched, albeit simple, solution than to leave decision makers with no feasible alternatives other than a Ouija Board and a crystal ball.

# CHAPTER ONE

## INTRODUCTION

How many cops does a city need to curb an escalating crime rate? The answer to this seemingly simple question has eluded academic researchers and created substantial controversy since the 1960s. Yet, it is a question of vital importance to police agency administrators. Police personnel account for an enormous portion of local government expenditures and, with ever-growing technological innovation, police payroll and efficiency-oriented technology must frequently compete for the same city dollars.

Public servants often joke that next year's needs are simply last year's plus ten percent. Unfortunately, there is much truth behind the humor. Local government budgets since the early 1900s have relied on the line item style of budgeting. According to Schick (1971), this form of budgeting emphasizes routinization and uniformity, making it extremely simple for administrators to implement and utilize. However, that routinization and uniformity tend to encourage incremental budgeting, with each year's budget based largely on the prior year's budget (Davis, Dempster and Wildavsky, 1966). For police administrators, this means their personnel budget is largely based on the prior year's budget, with most changes tied to election cycles rather than to crime rates or increased service demands (Levitt, 1997).

At an intuitive level, public administrators and the general public frequently view police officers as a critical mechanism for controlling crime. When crime begins to rise, citizen groups and police chiefs often call for aggressive recruiting and hiring in an effort to put more officers on the streets as quickly as possible. This intuitive response has considerable support in

the criminology research, as well. Criminologists have long recognized the importance of police response and action in the Classical Deterrence Theory (Beccaria, 1998) , the Rational Choice Theory (Cornish and Clarke, 1986), and the Routine Activity Theory (Cohen and Felson, 1979).[1] Unfortunately, because most governments operate with an incremental budget system, the reactionary cry for more officers often fails to examine whether the agency was staffed at a proper level in the first place. Two examples bear mention to illustrate this point.

In 1998, the Mayor of New York City proposed a preliminary 1999 budget that increased the number of uniformed police officers by approximately 4 percent, from 38,610 to 40,210. The estimated annual cost of the increase was $66 million. In a rare instance where actual staffing related to crime rates was examined, the city's Independent Budget Office (IBO) conducted a preliminary review of the FBI's readily-available statistical data on 25 large cities. They concluded that New York City already boasted more police per capita than any other large U.S. city (excluding Washington, D.C.). The proposed increase would have resulted in New York City having almost double the average number of police officers per capita in U.S. cities. The IBO then looked at changes in police officers per capita with changes in crime per capita over a six-year period. While most cities had in fact increased their number of police officers per capita while simultaneously reducing their crime rates, the IBO found the few cities with actual staffing decreases had also experienced either very large decreases or minimal increases in crime rates. Also, two cities had increased their number of police officers per capita and actually experienced a subsequent increase in crime rates (Independent Budget Office, 1998). This study

[1] These theories will be discussed in greater detail in Chapter 2 of this dissertation.

was preliminary in nature and was not conducted as an academic review. However, the practical implications of this line of inquiry are difficult to dispute. Especially in the current economic environment, yielding maximum results from efficiently spent tax dollars is of paramount importance.

The second example occurred in 2007 in New Orleans. Following the devastation of Hurricane Katrina in 2005, New Orleans was struggling with rebuilding infrastructure and attracting the tax bases lost during the storm. By the end of 2006, New Orleans was besieged with skyrocketing crime and an outraged public. City administrators repeatedly lamented high attrition rates within the police department as the culprit for out-of-control crime. At various times, budget enhancements were requested to increase staffing to all-time highs of 1,700 to 2,000 sworn police personnel. Interim measures included substantial overtime for police officers from the city's dwindling coffers and additional law enforcement assistance provided by the Louisiana State Police and the National Guard. Yet, despite the influx of manpower, crime rates continued to climb. In July of 2007, following an exhaustive examination of the Department, the Brown Group International (BGI) presented a strategic plan to the city. Recognizing the Department's commissioned strength of 1,233 officers and a population between 210,000 and 230,000, BGI surprisingly failed to include increased staffing as part of its strategic plan.

> The ratio of police officers to citizens is considerably more favorable (at this time) given the force strength and the reported population size. The proportion is approximately 6 officers per 1000 civilians. Although speculation exists that some positions at NOPD

should be civilianized, there remains a suitable margin (of officers) for increased population (Brown Group International, 2007, p. 22).

BGI made numerous recommendations for optimizing existing staff, such as conducting work demands analysis, consolidating functions, reorganizing, and re-districting. However, their extensive analysis simply did not support the city administration's claim that more police would solve the problems of rising crime and declining internal morale. Quite the contrary, a significant emphasis of the report was on the need to update equipment and facilities, demonstrating clearly the competition for tax dollars between personnel versus non-personnel expenditures (Brown Group International, 2007).

To grasp the full extent of the fiscal issues involved in police staffing levels, a summary review of nation-wide justice expenditures is helpful. In the most recent comprehensive studies of national data, Bauer (2004) and Hughes (2006) present the 2001 and 2003 statistics on behalf of the U.S. Department of Justice[2]. Tax dollars spent on justice represented the third largest category of domestic government program expenditures.[3] It was surpassed only by education (29 percent) and public welfare (14 percent), and was roughly equivalent to spending on health care (7 percent). In 2001, justice spending was a record $167 billion; and, in 2003, justice spending reached a new record of $185 billion. Of all justice expenditures, police protection accounted for slightly more than half, with corrections and courts making up the balance. A full two-thirds of police protection expenditure was for payroll. Roughly 2 percent of the nation's

[2] The next installment in this series, which will cover 2010 data, is in preliminary draft and not yet released by the Bureau of Justice Statistics.

[3] Program expenditures represent the combined totals of federal, state and local expenditures. Both civil and criminal justice expenditures were included.

labor force was employed in justice-related occupations, accounting for between $8 billion and $9 billion per month in payroll expense.

According to the data presented by Bauer and Hughes, approximately 50 percent of all justice expenditures came from local government and approximately 34 percent came from state government. Justice represented 30 percent of most local government budgets, and over 70 percent of that amount was used to fund local police services. Within that portion allocated to police services, over 70 percent of local government police expenditures went toward police payroll. To put this expense into perspective, for the months of March in 2001 and again in 2003, local governments spent over $3 billion each month on police payroll.

Clearly, staffing levels for city police departments is an issue of tremendous fiscal and practical concern. Yet, administrators seeking guidance on this issue are met with a glaring void in the research and literature. Despite numerous research articles attempting to quantify the impact numbers of police officers may have on crime rates, none of the literature has attempted to distinguish the impacts of staffing levels in agencies that are already under-staffed contrasted with agencies that are already over-staffed. To put this concept into simple terms, increasing a dramatically over-staffed agency by ten percent has been treated the same as increasing a dramatically under-staffed agency by the same percentage. This treatment has been consistent among researchers, government administrators, and media reports. In order to fully explore the relationship between police-to-citizen ratios and crime, we must first identify the optimum range of police-to-citizens ratio so our future research can start from a solid baseline or foundation. Without that foundation, research in this subject area will continue to be fraught with conflicting

findings and, as a result, will be of limited use to administrators trying to figure out if their agencies genuinely need more personnel.

The literature foundation for this dissertation covers five areas: a brief discussion of the criminology theories used to link police officers with crime control, an overview of police staffing level research, an historical overview of the various law enforcement strategies as they relate to manpower requirements, an historical overview of government budget strategies as they relate to manpower funding determinations, and an overview of police deployment strategies.

First, the belief that more police officers leads to lower crime is routinely based on three models of criminal behavior: deterrence, rational choice, and routine activities. I will offer a brief description of each of these theories and will discuss how the police function impacts crime according to each of these three models.

Second, there is a relatively small body of literature related specifically to police staffing. This literature falls into two primary categories: simple statistical accounts of current staffing levels with no analysis, and complex statistical analyses of the relationship between number of police officers and crime rates. The studies have widely varied and conflicting results, with no genuine consensus on the relationship between police staffing levels and crime rates. This part of the literature discussion will demonstrate the research void being filled by this dissertation.

Third, it is vital that researchers understand evolving law enforcement strategies impacting the police role and practices within agencies over time. There are three commonly recognized policing eras: watchman era, professional era, and community era. Each era was marked with varying staffing needs that undoubtedly formed the basis for current levels.

Furthermore, there is some indication that a fourth era of policing is emerging as a response to current information sharing capabilities. This fourth era, known as the intelligence-led or strategic management era, will undoubtedly produce its own unique personnel demands.

Fourth, numerous budgeting strategies have emerged since the 1920s. Unfortunately, most of these strategies have proven difficult to implement, administer, and evaluate. As a result, cities continue to rely on incremental budgeting, which tends to perpetuate incremental staffing changes that are unrelated to crime rates or service needs. I will briefly explain how identifying an optimum staffing range will make non-incremental budget strategies more feasible for agencies in the future.

Fifth, the Kansas City Preventive Patrol Experiment (Kelling,1974) led to a field of literature that examined the effectiveness of manpower-intensive proactive patrols. This body of literature challenges the notion that more police in the field leads to less crime.

The goal of this dissertation is to determine an optimum range of per capita staffing for local police agencies seeking to impact emerging crime trends. This question is of greatest importance to government administrators and budgeting authorities, both of whom need concise guidance on establishing their cities' baseline ratios of officers to residents. In order to best respond to the targeted audience, I have framed the question in the terms most relevant to administrators seeking to address short-term, year-to-year changes in crime rates.

**Research Question: What is the ratio of police officers to citizens that has the greatest potential to impact crime from one year to the next?** To address this question, I will examine the relationship between police officer per capita staffing levels and year-to-year changes in

crime rates. This relationship will be examined separately for cities with low police-to-citizen ratios, moderate police-to-citizen ratios, and high police-to-citizen ratios.

**Hypothesis: Higher police-to-citizen ratios have a negative and linear relationship with crime levels.** This dissertation will distinguish itself from similar studies by testing this hypothesis for three separate staff level groupings: minimally, moderately, and highly staffed. It will also distinguish itself by examining short term changes over brief year-to-year time frames. Identifying the range of officer to citizen ratios that fall within each staffing level will be part of this dissertation. Consistent with earlier research on police staffing levels, this dissertation will examine impacts on both violent and non-violent crime categories.

# CHAPTER TWO

# REVIEW OF THE LITERATURE

Because on-point literature is somewhat scarce and highly conflicting, I have approached the assessment of police agency staffing levels from a multi-disciplinary perspective. Literature is examined in five different areas. First, I provide a very brief overview of the criminology theories upon which the police-to-crime correlation is believed to rely. Second, I examine in depth the public administration literature that specifically relates to staffing and expenditure levels for police agencies. Third, I examine the social and historical context of the police role by assessing the three recognized eras of policing and then integrating those historical eras with newly emerging criminal justice system trends. Fourth, I examine the historical development of budgeting strategies and demonstrate how the subject of this dissertation may facilitate the use of efficiency-oriented budget systems by police agencies. Finally, I examine the criminal justice literature on the various tactics and strategies used by law enforcement professionals to deter, prevent, and reduce crime.

## Literature on Theories of Criminal Behavior

*In keeping people straight, principle is not as powerful as a policeman.*
*- Abel Hermant, Le Bourgeois*

Before beginning an inquiry on police staffing levels, it is important to first understand the underlying principles that lead us to believe police officers have an impact on crime. The literature on the sociological and psychological roots of crime is immense; however, three dominant theories are most appropriately tied to the belief that police officers reduce crime.

The first of those theories is Classical Deterrence Theory. Cesare Beccaria (1738-1794) and Jeremy Bentham (1748-1832) are universally recognized as the fathers of Classical Deterrence Theory. According to Beccaria (1998), humans are pleasure-seeking beings who attempt to avoid pain while maximizing their pleasure. In order to control undesirable behavior, it is necessary to administer a reasonable and calculated punishment that outweighs the pleasures associated with committing a crime. Beccaria believed punishment would only deter the individual from future criminal behavior if the punishment was administered swiftly, with certainty, and with a severity specifically calibrated to outweigh the illegal activity's benefits. While incapacitation through imprisonment would obviously control the individual's behavior during incarceration, it would not deter the individual's post-release behavior if punishment was not commensurate with the damage done during the offense. This position offered a dramatic departure from incapacitation-based strategies popular during Beccaria's lifetime. According to Classical Deterrence Theory, excessive or random punishment would be seen as unjust and would increase the likelihood of criminal behavior instead of decreasing it. The concept that an individual's future criminal behavior could be modified through swift and sure apprehension is known in modern literature as specific deterrence.

Bentham (2008) is best known for his utilitarian approach to punishment, particularly as it relates to imprisonment. His view is that reasonable, calculated punishment of someone who commits mischief will serve as an example that deters others from committing similar offenses. The concept that society's future criminal behavior could be modified through swift and sure apprehension is known in modern literature as general deterrence.

The Classical Deterrence Theory that emerged from the Beccaria - Bentham school of thought is that individuals will be dissuaded from committing crimes by the threat of swift, certain and reasonably calculated punishment. The nexus between classical deterrence and police action is quite clear: police officers serve as the mechanism by which a criminal is brought into the penal system both swiftly and with certainty. In the absence of adequate policing, the threat of punishment becomes too remote and too random to effectively deter criminal behavior. The importance of swift and sure police action goes beyond merely addressing a single wrongdoer in Classical Deterrence Theory. That swift and sure police response is a vital part of sending a message or making an example of the wrongdoer in order to deter others in the community who might contemplate similar mischief.

The second theory which relies heavily on police action is Rational Choice Theory. Cornish and Clarke (1986) draw on the philosophies of Beccaria and Becker to develop a needs-based model of criminal behavior. Rational Choice Theory, much like its deterrence predecessor, relies on the assumption that humans are rational actors who are free to choose their behaviors. Borrowing from the economics field, Cornish and Clarke believe individuals conduct cost-benefit analyses at various stages of the criminal behavior timeline. At the core of this theory is an ongoing and continuous decision making process that starts with the decision to consider criminal involvement and continues throughout the execution of the criminal event. The authors see numerous opportunities during this process for behavior to be modified prior to the crime actually being committed. As with Classical Deterrence Theory, Cornish and Clarke believe the swiftness, certainty, and severity of punishment is key to controlling criminal

behavior. Rational Choice Theory examines different types of crimes in different contexts, and recognizes benefits ranging from property gain to sexual pleasure. However, its most common modern application is in the analysis of property crimes, where analysis of the potential economic gains of a criminal act is easily quantified by someone contemplating criminal activity. The nexus between police action and Rational Choice Theory centers on swift and certain apprehension of violators, much like its deterrence predecessor. However, Rational Choice Theory expands the opportunities for police intervention by suggesting prevention can occur at any point during the planning phase. An effective police department's goal is to ensure the risk of apprehension outweighs the potential rewards and, ideally, to convince the rational actor of this imbalance before the crime has been committed.

The third theory that supports the belief that police action impacts crime is Routine Activity Theory. Felson and Cohen (1979) break from the classical deterrence-based theories and offer an ecological, event-based approach to crime. Their theory proposes that crime occurs when three conditions converge: a motivated offender, a susceptible target, and the absence of a guardian. Unlike the deterrence models, which focused on individual behavior, Routine Activity Theory focuses on the event and the location. Most of Felson and Cohen's work centers on altering the environment and changing potential victims' behavior patterns in order to reduce the likelihood of their three necessary conditions being met. However, the theory can also be used to offer an alternative to the deterrence-based explanations of the nexus between police officers and crime. Police officers are commonly viewed as society's guardians, frequently conducting high visibility patrols designed to discourage criminal conduct. By fulfilling the guardian role

identified by Felson and Cohen, police officers effectively disrupt the convergence of the three necessary conditions required under Routine Activity Theory. In this theory, police officer intervention is a disruption rather than a deterrent.

In summary, police officers reduce and/or prevent crime through two mechanisms. The most prominent impact is through the threat of swift and certain apprehension of violators in a manner that deters the offender from future crimes and that deters other individuals through example. The second impact is through high visibility patrols designed to disrupt criminal events by serving in a guardianship capacity. Administration and application of these impact mechanisms will be discussed at length in the section on policing styles and the section on police effectiveness and management.

Before moving forward, a brief synopsis of anecdotal evidence on the link between police officers and crime may prove useful. In the next section, we will examine the wide range of beliefs on the number of officers needed to police a city. However, there is considerable agreement throughout the criminal justice community that police officers are a necessary and important part of the crime equation. This almost universal belief is best illustrated by examining instances where the police stop patrolling. Two examples are offered to illustrate the impact of no police on crime in Western capitalist societies: The 1919 Boston police strike and the 2014 Argentina police strike.

In Boston, 1117 of the city's 1544 officers went on strike at 5:45 on a Tuesday afternoon in 1919 (Lyons, 1947). By midnight, conditions had deteriorated and frenzied disorder engulfed

the city. While 427 police officers remained on the job, their numbers were too small to overcome the chaos that had erupted.

> A rock was hurled through a window, and the mob rose. Buildings throughout the city were broken into and looted. Policemen who attempted to interfere were severely beaten. Professional robbers, who had headed for Boston to take advantage of an easy chance, methodically filled waiting cars with booty (Lyons, 1947, p. 161).

A contingent of volunteers had been sworn and readied by the mayor in preparation for the strike. However, when they attempted to restore order on Wednesday morning, the group of inexperienced men with no uniforms was quickly turned back by the rioting mobs. State Guard units began arriving Wednesday evening and quickly began their assault against the mobs of law breakers. During the ensuing struggles, three rioters were killed. By Thursday evening, over 7,000 State Guard were patrolling the streets of Boston and order had been restored.

Almost a century later, police officers in twenty Argentina provinces went on strike over the course of a week in December of 2013 (D'Alessandro, 2013). With only a small handful of officers refusing to participate in the strikes, cities across Argentina found themselves quickly and unexpectedly unprotected. As with the Boston example, the small number of officers who remained at work was helpless to overcome the massive crime waves that had erupted throughout the country by Monday.

> More than 2,000 stores, mostly supermarkets, were looted and many were burned down. Houses and apartment buildings in some cities were also attacked by armed gangs. A business group estimated property losses at nearly $100 million (D'Alessandro, 2013).

Government officials quickly worked to meet the striking officers' demands and most had returned to work by Wednesday. As of Friday, order had been restored in most provinces. Yet, in those five short days, the looting and violence left thirteen people dead and over two hundred injured.

These two examples demonstrate how quickly order can become chaos in the absence of a functioning police department, and how officers returning to work can restore order as quickly as it was originally lost. Clearly, police officers serve a vital role in controlling crime, and maintaining adequately staffed forces are critical to the success of a city's leaders. The question that arises from this overview centers on determining how many police officers does a city need.

## Literature Specifically Related to Police Staffing

*You won't find a voter that says, "We don't need more cops."*
*- Jon Shane, John Jay College*

Bauer (2004) presents a summary of justice spending and employment for the year 2001. While the bulk of this report is dedicated to identifying the nature of justice expenditures nation-wide, a small portion of the report presents raw data on police staffing levels. The data is summarized on a state-by-state, per capita basis. The report establishes the range of total full time police and civilian employees as 2.05 (Vermont state average) to 4.53 (New York state average) per 1,000 residents. The range of full time sworn police employees ranged from 1.46 (Vermont state average) to 3.89 (New York state average) per 1,000 residents. This report is intended to merely present a statistical summary and, as such, makes no attempt to analyze the

appropriateness of any agency's staffing levels. The next summary report in that series (Hughes, 2006) does not include the data on number of police employees per capita.

**Administrative Research**

The report of the Independent Budget Office of the City of New York (1998) offers an administrative assessment of the relationship between police officers per capita and criminal offense data. This report, explained at length in the introduction chapter, examined staffing size relative to reported crimes for 25 major cities. New York City and Washington D.C. both boasted in excess of 5.3 sworn police officers per 1,000 residents. The remaining cities averaged only 2.9 sworn police officers per 1,000 residents, with a range of 1.3 to 4.7 officer per 1,000 residents. This report offered a cursory and preliminary comparison of changes in crime rate to changes in police staffing levels from 1990 to 1996 for 21 cities that had complete data available. Sixteen cities had increased their staffing levels from 1990 to 1996, and 14 of those experienced mild to dramatic decreases in crime rates while two cities with increased staffing levels experienced moderate increases in crime rates. Four cities and Washington D.C. reduced their staffing per capita; yet, three of those cities also experienced mild to dramatic decreases in crime rates. Washington D.C. and the fourth city experienced moderate increases in crime rates.

The IBO report clearly appreciated New York City's accomplishments in dramatically reducing crime and deservedly boasted of the city having one of the lowest crime rates in the country. However, the report was cautious in its refusal to attribute that success simply to the 20 percent increase in police staffing that occurred between 1990 and 1996.

> Clearly, crime has been going down in the 1990s in New York City while the number of police officers has gone up. What is less clear, however, is the precise relationship between the two trends. That is, has crime fallen primarily because of rising police staffing levels, more effective deployment of police resources, or some combination of the two? To what extent have factors such as demographic shifts, alterations in drug consumption patterns, rising rates of incarceration of offenders, or some combination of these and perhaps other factors contributed to the declines in reported crime? (Independent Budget Office of the City of New York ,1998, p. 4).

Of considerable importance to the IBO were the cities of Dallas and Seattle. In both cities, the number of police officers per capita declined between 2 and 6 percent; yet, each enjoyed dramatically declining crime rates between 18 and 39 percent.

While the IBO report offers one of the clearest examinations of the police staffing versus crimes per capita issue, there is much room for expansion. The report, after all, was preliminary in nature and was not intended to present an extensive academic review of the matter. However, the most obvious question that remains at the conclusion of the report is whether staffing levels substantially above or below the median have any impact on crime rates. While drawing few actual conclusions, the report clearly shows the need for detailed analysis of police officer staffing levels to assist government administrators in the future.

A 2001 research forum (Moty and Maloney, 2002) attempted to establish guidelines for determining staffing of a mid-sized police department faced with community growth. The forum identified six trends that appeared to consistently impact a department's staffing needs: changing

population demographics, cost of technology, global economy, tax revenue, quantity of qualified applicants, and quality of life. They then identified six events that could impact a department's ability to provide adequate staffing in the growing community: decreased tax revenue, mandated retirement, political elections, unfunded mandates, industrial expansion, and annexation. [4] From this base, forum participants attempted to establish guidelines for a hypothetical police chief to follow in staffing and organizing her department. Four strategies emerged from the forum: work smarter, adopt COPPS (Community Oriented and Problem-Solving Policing) philosophies, pursue community enhancement strategies, and "promote the support of a departmental staffing growth plan that balances identified minimally acceptable staffing levels and a standard for increasing personnel based on a per-thousand population ratio with the demonstrated needs of the community" (Moty and Maloney, 2002, p. 5).

The research forum identified trends and events that could impact departments' staffing needs and abilities, and it also identified the need to establish a base staffing level in conjunction with standards for increasing staffing on a per capita basis. Unfortunately, however valid the strategy might be, it offers no guidance on how to establish that base staffing level or the standards for per capita increases. Once again, the practical trade-oriented literature points to an administrative need for per capita staffing level guidance.

[4] The absence of crime from these lists is noteworthy. Levitt (1997) identified the idiosyncratic nature of staffing decisions. In his assessment, staffing decisions are largely controlled by the strain between budget cycles and election cycles. Given Levitt's theory on staffing decisions, the absence of crime as a decision criteron is not surprising.

**Academic Research**

There is only a small body of academic research on the relationship between agency size and effectiveness. Pogue (1975) offers one of the first research studies. He examined the relationship between police per capita, crime, and a multitude of socio-economic variables. This research examined five years of data from 1962 to 1967. He concluded that differences in crime rates were related to environmental factors rather than police agency size or expenditure. There was some indication that increasing crime rates led to larger police departments; but, overall, he felt that marginal increases in agency size or spending did not impact overall crime rates. Stucky (2005) also suggested that increasing crime rates led to larger police departments. He examined unreformed government systems characterized by mayor-council government, district-based councils, and partisan elections. His research led to a finding that those unreformed political systems tended to have more police employees per capita than more modern systems. This was a result of enhanced responsiveness to public demand for increased police presence during times of increased crime.

Cordner (1989) examined the impact of police agency size on investigative effectiveness. His examination included agencies within five regions in the state of Maryland for the year 1985. The research is distinguished from the others as he used raw agency size as opposed to officers per capita, and he focused on clearance rates rather than crime rates. He concluded that region had a greater impact on clearance rates than agency size.

The body of literature focusing on correlations between crime rates and increases in per capita police strength is fraught with conflicting findings and controversy. Quite simply, there is

no consensus on the issue. Loftin and McDowall (1982) conducted a time series analysis of police employees and crimes per capita in Detroit between 1926 and 1977. They found no significant relationship between police strength and crime rates. Their approach was to suggest that tactics or very large variations in police strength are more likely to impact crime than the small variations found in Detroit.

At the opposite end of the spectrum, some researchers have found a strong negative relationship between police strength and crime rates. Donohue and Ludwig (2007) found that violent crime rates were declining during the 1990s when the number of police throughout the country was rising. As the number of police per capita began to decline, the crime drop stalled. Their research is national, based on the total number of police officers throughout the country. And, they inexplicably calculate violent crime rates through the use of homicide rates only. From this, they concluded that more police lead to less crime.

The Donohue and Ludwig research, however, must be taken with the proverbial grain of salt. This is a policy brief on behalf of the Brookings Institution imploring the federal government to restore the $1 billion annual state and local hiring grants that were distributed as part of the COPS (Community Oriented Policing) program from 1995 to 1999. The brief states, "The best available research suggests that putting more police officers on urban streets is one of the most cost-effective ways to reduce crime" (Donohue and Ludwig, 2007, p. 3). However, there is no reference to specific research articles or results with which to support the claim. In fact, the brief does not even include a bibliography. Further, they draw conclusions about urban

police strength and urban crime rates utilizing national data from rural, suburban, and urban areas.

Another flaw in this particular analysis was its pattern of equating increased spending on police personnel with increased numbers of police officers. At its peak, the COPS program only added an additional 2 percent to police strength. According to Donohue and Ludwig, the $1 billion program actually only funded hiring of an additional 11,900 officers per year nationwide. They do not specify what additional equipment, services, or civilian employees may have been funded from that $1 billion. We are left wondering how much those 11,900 officers actually cost. Finally, the policy brief neither addresses the sharp peak of personnel strength reached in 1999 with no attendant decline in violent crime nor does it address the steady decline of police strength between 2000 and 2005 that resulted in absolutely no change in violent crime rates. The graphical depiction further shows a dramatic increase in police staffing from 1989 to 1990 that actually corresponded to a moderate increase in violent crime. In essence, the data presentation simply does not support the conclusions drawn in the brief.

Of greater academic weight is Levitt's (1998) research on the relationship between police staffing levels and victim reporting. Levitt alleges prior research[5] showing no relationship between police per capita and crime rates failed to account for the positive effect more police have on victims' likelihood to report crimes. Because prior research utilized reported crimes to determine crime rates, that body of research failed to account for unreported crime. Levitt used three different measures of victim reporting in his research. First, he examined victimization

[5] The prior research examined by Levitt includes Pogue (1975), Cordner (1989), and Loftin and McDowall (1982), all of which were discussed earlier in this review of the literature.

studies conducted between 1971 and 1975. Second, recognizing that murder is reported with consistency and accuracy, he examined ratio of murder to overall crime as a mechanism to determine the gap between reported and unreported crime between 1970 and 1992. Third, he examined Department of Justice victim surveys between 1973 and 1991.

Based on his statistical calculations, Levitt found a link between changes in the number of sworn officers and changes in victim reporting behavior. According to his calculations, each extra police officer leads to the reporting of 5 additional index crimes. He found no significant change in arrest numbers to correlate with the added police officers, so he determined the greater availability of police officers was what ultimately led to changes in victim behavior. Because most crime rate research relies on the number of crimes officially reported to police, Levitt believed the research overlooked the impact of heightened victim reporting on those calculations. In other words, he believed more police led to lower actual crime and any increases found by researchers were simply a reflection of the higher percentage of crimes being reported. While Levitt's work does provide an important cautionary note to researchers examining crime rate data. He points out that studies based solely on reported crime rate data have a bias direction that serves to make additional police officers slightly more attractive than the statistical results show. According to Levitt, the bias is not large enough to negate findings of no significant relationship between police and crime; however, a significant relationship that is found in a study based on reported crime data only will be slightly understated, but clearly not invalidated.

O'Brien (1996) confirms Levitt's research to some degree. In his study, he found the gap between reported and actual crime diminished substantially between 1973 and 1992. From this

finding, he determined that police productivity with respect to documented crime incidents had reached a peak and greater performance in that respect was unlikely. O'Brien did not specifically examine the impact of additional police on victim reporting rates like Levitt. However, Levitt's and O'Brien's research is consistent in its proposition that 1990s era crime rates may have appeared elevated due to increased victim reporting rates.

Three relatively recent studies serve as the foundation for researchers hoping to determine that nexus between staffing levels and crime with greater precision. Those studies are Marvell and Moody's observational study using Grainger causation methods in 1996, Corman and Macon's observational study using high frequency time variables in 2000, and Levitt's panel study using instrumental variables in 2002.

Marvell and Moody (1996) examined 59 city and state agencies in a time series study spanning twenty-two years (1973-1982). The cities all had staffing levels greater than 1.25 officers per 1,000 residents, and cities ranged between 90,000 and 7.9 million population. Their study employed a Grainger causality method[6] in order to distinguish increases in police officers caused by increases in crime from increases in police officers causing decreases in crime. They determined causation flowed in both directions; however, the effect of police officers on crime was stronger than the effect of crime on police officers with a -0.30 overall elasticity.[7] Police

[6] The Grainger causality test examines predictive causality between two time series analyses. The test is primarily used in economics and its use in other disciplines has been called into question by Dr. Grainger. (Grainger, 2003)

[7] The term elasticity used in staffing level studies refers to the rate of change in the dependent variable based on incremental changes in the independent variable(s). Studies conducted by economists will frequently use this term while studies conducted by criminal justice researchers will discuss rate of change or slope coefficients. Throughout the literature review, I have used the specific terminology chosen by the individual researcher as a reflection of the discipline-specific nature of their individual research findings. For example, an elasticity of -1.00 indicates one less crime committed for each additional officer hired.

officer numbers had a negative impact on overall crime, and had category specific negative impacts on all categories except rape and assault. The causal relationship was stronger at the city level than at the state level.

Corman and Mocan (2000) examined monthly data for New York City only between 1970 and 1996. This study was unique in its ability to use high frequency data that is generally not available at the national level.[8] They examined the impacts of both the number of police officers and the number of arrests on seven categories of crime. They found a significant, negative relationship between the number of police officers and crime rates, with elasticities ranging from -0.29 to -1.385. They found that number of arrests was a slightly better predictor than number of police officers for murder, burglary and motor vehicle theft; although, both showed significant negative relationships to each of those categories. The number of police officers was the better predictor for robbery, assault, and larceny. No significant relationship existed between either number of police officers or number of arrests and the crime category of rape. The authors expressed concern about collinearity between number of police officers and number of arrests; but, they concluded police officer efficiency had a greater impact on arrest statistics than police officer numbers.

Levitt (2002) offers one of the most prominent studies on the relationship between police officer staffing and crime rates. [9] In his study published in 2002, Levitt examined 122 cities

[8] High frequency data refers to rapidly occurring information. Typical data in this research area is annual. For that reason, data available on a monthly basis is considered high frequency data in this research field.
[9] Levitt conducted an earlier study in 1997. While that study provided useful findings on the nature of police employment cycles, the statistical link between staffing levels and crime rates was successfully refuted by McCrary in 2002. Levitt's 2002 study corrects those statistical deficiencies; therefore, the 1997 study's findings on the correlation between staffing levels and crime will not be discussed in this section.

with populations greater than 100,000 between 1975 and 1995. He sought to use an instrumental variable that would predict changes in police officers without predicting changes in crime.[10] Determining that both police officer and firefighter staffing levels were linked to similar political influences, Levitt used number of firefighters as an instrumental variable in an effort to control for multi-year police hiring trends unrelated to crime trends. Levitt confirmed a negative relationship between number of police officers and violent crime, with an elasticity of -0.076. He also found a smaller, but still negative, relationship between the number of police officers and non-violent (property) crime at an elasticity of -0.218. This finding confirmed the results achieved in the Marvell and Moody study and in the Corman and Mocan study.

To summarize the literature on police staffing, there is only a small body of research available linking police agency staffing to crime rates. The research that does exist primarily examines increases in police strength without establishing a solid baseline; so, a 10 percent increase in a department staffed at 1.6 officers per 1,000 residents is treated no differently than a 10 percent increase in a department staffed at 4.7 officers per 1,000 residents. Guffrey (2009) points out this tremendous oversight and offers a cursory, preliminary study to open the door for a larger discussion. That study will be discussed in more detail as part of the Data and Methods portion of this dissertation.

Most of the research on police staffing levels examines staffing levels during the time period immediately prior to and during the height of the personnel intensive and heavily funded Community Oriented Policing era. This makes it difficult to separate the impact of nation-wide

[10] An instrumental variable predicts changes in an independent variable without predicting changes in the dependent variable. It is commonly used in time series analyses performed by economists.

shifts in strategies, tactics, funding, and technical resources from the impact of raw manpower strength. I therefore now turn to a discussion of the relationship between policing strategies and staffing levels.

## Literature on the Evolution of Policing Styles

> *Community-based policing has now come to mean everything. It's a slogan. It has come to mean so many different things that people who endorse it, such as the Congress of the United States, do not know what they are talking about.*
>
> *-James Q. Wilson*

### The Watchman or Patrol Era

Monkkonen (1981) traces the early history of policing in the United States. He begins with a description of the early citizen watch, where citizens patrolled the urban streets at night as part of their civic duty. Eventually, this system became problematic as the more responsible members of society simply hired vagabonds and paupers to fulfill their patrol duties. Before long, cities recognized the need for a paid and professional police force. By the mid nineteenth century, urban areas had gradually transitioned from volunteer civilian watchmen to uniformed professional patrolmen. At this time, the police department was responsible for controlling a supposedly crime-prone group known as the "dangerous class." Services included providing overnight lodging for the homeless, returning lost children, arresting disorderly subjects, and apprehending criminals.

Staffing during this era was expanding quickly in an effort to keep up with rapid population growth caused by large immigration waves. The policing philosophy at the time was that visibility was the key to preventing crime and maintaining order. Uniforms offered one mechanism for enhancing visibility. And, large numbers of officers offered another way to

achieve that goal. Staffing decisions were focused on cost. Police officers were unskilled, untrained, and poorly paid. However, the belief was their mere uniformed presence would deter crime and reduce the need for more expensive arrests, trials, convictions, and incarcerations.

As the reform movement progressed throughout the country, the police role also changed. There was a philosophical shift away from the concept of controlling the "dangerous class," a job that had included both humanitarian and enforcement undertakings for police officers. During the 1890s, social work groups began taking responsibility for paupers and neglected children. The role of police officers shifted in the direction of preventing crime instead of controlling unsavory class elements. Despite this shift in the underlying rationale, basic police strategies did not change dramatically. The belief was still strong that police could prevent crime through being visible, so police continued to patrol the streets in a style similar to the early watchmen.

Monkkonen also evaluated police strength during these early years. He first examined the period from 1860 until the 1890s. This period was characterized by professional, uniformed police evolving into a stable institution that was becoming firmly entrenched in city government. Early during this period, Monkkonen found police strength was relatively low, with a median of 1.32 police officers per 1,000 residents. However, of notable significance, Monkkonen found that arrests independently initiated by police officers for nuisance-type violations were positively related to police strength during these years.

Monkkonen next examined the period from the 1890s until the 1900s. This period was characterized as the transitional period where policing shifted from class control to crime prevention through visibility. Large immigrant waves and frequent economic distress were

associated with escalating crime rates, and cities responded by hiring more police officers. Larger cities appointed supervisors within their police departments and also created specialized units, such as detective bureaus. In some instances, additional police officers did not genuinely translate into more officers on patrol; rather, the additional manpower was used to supervise beat officers or to specialize in practices like thief catching. Unlike the earlier period, police strength had no bearing on the number of self-initiated arrests during this period through the conclusion of his study at the 1920s.

Monkkonen characterized the period from the 1900s until the 1920s as a time of stabilization at modern levels. He found police strength in 1908 to be a median of 2.07 police officers per 1,000 residents. This figure was very much in line with police staffing in 1981, which ranged from 1.7 to 2.3 police officers per 1,000 residents. That police staffing per capita remained relatively constant for almost a century is quite remarkable. It is even more remarkable considering the dramatic progress in the law enforcement field during the era of professionalism from the 1920s until the late 1970s.

**The Professional or Reform Era of Policing**

Carte (1973) describes the professional life and accomplishments of one of the most notable, reform-minded police chief in U.S. history. August Vollmer was police chief of Berkeley, California from 1905 -1932. His vision was to transform policing into a high status and politically detached profession. He embraced the philosophy of the Progressive Era and its civil service movement by insisting police departments function with minimal political interference. He further demanded high recruiting standards and ongoing education for officers.

At a time when political machines were entrenched in many cities and when police officers were simply unskilled laborers wearing livery-style uniforms, his vision was truly groundbreaking.

Vollmer is known for having the first scientific crime lab, the first lie detector machine, the first formal police training regimen, the first use of psychological and intelligence tests for recruits, and the first to encourage college graduates apply for police jobs. He used the press effectively to develop solid community rapport, and stressed crime prevention techniques focused on targeting at-risk juveniles. His efforts were successful in giving to Berkeley the lowest crime rate while also having the lowest per capita cost. During an era of skyrocketing crime, riots, and economic depressions, Vollmer managed to find the right formula for keeping Berkeley safe without an outlandish payroll. His predecessors had focused on more officers; he, however, focused on better officers, better equipment, and better techniques.

In addition to his role as police chief, Vollmer was also a very active college professor at the nearby university. His success in Berkeley was undoubtedly far ahead of its time; and, it is unlikely he would have met with such tremendous acceptance elsewhere in the country during those early years. However, his students were able to spread the philosophy of professionalism years later when the corrupt political machines began to collapse.

Bopp (1977) examines one of Vollmer's most successful and influential students, O.W. Wilson. Wilson served as police chief in three cities during his life, established the School of Criminology at Berkeley in 1950, and quite literally wrote *the* book on police administration. Wilson built upon Vollmer's philosophy of professionalism, and spread that philosophy as he traveled throughout the country. He expanded on Vollmer's innovations with several of his own.

His contributions were in records management, high-visibility lights atop police cars, development of a law enforcement code of ethics, utilization of one-man patrol cars, internal integrity investigations, risk assessment testing for juveniles, part-time cadet programs, ongoing personnel evaluation, graduated pay scales, and probationary periods for new hires. Despite the unpopularity it caused, Wilson also ended police acceptance of favors from local merchants and politicians.

Wilson is best known as the superintendent of the Chicago Police Department under the legendary Mayor Daly. The department was in a state of complete disarray, besieged by internal corruption and community outrage. Wilson was drafted to clean up the department and restore order to the conflict-torn city, and his success was remarkable. Much to his advantage, the movement toward professional policing was well underway by the time he accepted the Chicago position in 1960. And, his dramatic success using that approach undoubtedly contributed to the lasting impact of the professional model.

With respect to staffing, Wilson was notorious for his extravagant spending. However, from all indication, the spending was dedicated to equipment and incentives (Bopp, 1977). There is no mention of hiring sprees or heavy staffing levels. Quite the contrary, Wilson was well-known for his propensity to terminate employees with minimal provocation. He wanted the best and brightest young men; sheer numbers apparently held no appeal for him.

Wilson's (1977) incredibly thorough work on administering police agencies only mentioned staffing levels briefly. The bulk of his work was focused on the organization and functioning of agencies. However, in Appendix K, he does mention the concept of manpower

allocation. In fact, he asks the very question at the heart of this current research, "What is the optimum number of officers to be employed for a specific city?" (Wilson, 1977, p. 658). Wilson believed the answer could not be determined because the precise effect of preventive patrol on street crimes was unknown. Ironically, just three years prior to publication of the fourth edition of Wilson's book, the Kansas City Preventive Patrol Experiment (Kelling, 1974) gave us that missing piece of information. Wilson's section on allocation also called for time studies of patrol activities, experimentation and analysis with divisions between investigation and preventive patrol, thorough exploration of response time effects on apprehension, and mathematical techniques designed to identify points of diminishing returns. The information voids preventing Wilson's determination of optimum staffing levels have been largely filled by modern research and data warehousing. So, while Wilson does not provide substantial guidance to administrators looking for an optimum staffing level formula, his detailed recommendations on agency structures, officer specializations, and response protocols clearly offers the organizational and managerial foundations needed to properly evaluate the subject in modern times.

The progressive attempts to professionalize policing had an unintended consequence. While officers became more skilled, more educated, and theoretically more respectable, they also became more detached from the community. By the mid-1970s, dissatisfaction with the formal and rigid professional policing model began to grow.

**The Community Era of Policing**

Vollmer and his professional era colleagues responded to rampant police corruption fueled by the political machines, excessive police force caused by lack of alternative skills, and public disdain that resulted from the non-professional labor orientation of watchman era policing. In many ways, the humanitarian side of policing that existed from 1860-1890 completely vanished during the professional era. That separation of police from humanity was compounded by the widespread use of patrol cars, which ultimately reduced casual contact between citizens and police. The professional era police department was by-the-book and discouraged the use of officer discretion when faced with minor violations, frequently widening the gap between officers and the general public.

A public feeling alienated from their protectors started to long for a return to the glorious days of the neighborhood beat cop. Unfortunately, the public was too young to remember the excessive force, political patronage and favors, corruption, and class profiling that had caused citizens at the turn of the century to regard police officers with disdain and mistrust. So, the romanticized vision of Officer Friendly walking his neighborhood beat sparked the third era of U.S. policing.

This era is frequently called the Community Oriented Policing (COPS) era. However, that terminology is somewhat misleading. COPS is actually only one of three dominant strategies that arose during this phase. The other two strategies, Broken Windows and Problem Oriented Policing (POP), each offer slightly different elements and techniques. All three

strategies, however, do focus on various aspects of community involvement. So, for purposes of this review, we will simply refer to the period as the Community Era of Policing.

There are two critical aspects of this era to consider during the review of dominant literature. First, there was considerable federal funding of both criminal justice and social programs throughout this era. It is difficult to attribute success to any one element because so many tactics were being utilized at once. Increased manpower, enormous technological progress, expanded record-keeping, Comstat[11] administrative accountability procedures, neighborhood redevelopment programs, school-based education programs, and dramatic interdiction against highly organized Colombian drug cartels offer only a small sample of the crime reduction measures funded with federal dollars. Second, these styles of policing proved to be extremely personnel intensive. While police staffing remained relatively stable during the last two phases of the Watchman Era and through the entire Professional Era, police strength per capita skyrocketed during the height of the Community Era.

The Community Era of policing was catapulted into the public limelight with James Q. Wilson and George L. Kelling's legendary "Broken Windows" article that appeared in the popular magazine, *The Atlantic Monthly* (Wilson and Kelling, 1982). The authors based their analysis in part on a New Jersey pilot program from the 1970s that took police officers out of patrol cars and put them on walking beats in neighborhoods. Their assessment was that the foot patrol officers elevated the level of public order in neighborhoods by dealing with disorderly

[11] Comstat or Compstat is an administrative and management system designed to provide rapid response to emerging crime trends through the use of data, statistics, and maps. Regularly scheduled, computer-generated crime reports are used to shape enforcement response strategies. Management and supervisory personnel are then held accountable for the success or failure of their strategies at meetings which are frequently open to the public.

people like rowdy teenagers, loiterers, and panhandlers. Second, the authors relied on a psychology experiment from the 1960s that demonstrated that untended property, such as an automobile with its windows broken out, would become fair game for thieves and vandals. Building on that concept, Wilson and Kelling suggested that tending to maintenance and physical orderliness in neighborhoods would serve as a deterrent to criminals and a building block for communities. Third, the authors conclude that disorderliness leads to a fear of crime which ultimately leads to community members isolating themselves. This isolation then provides a fertile ground for criminals to act unobserved.

Wilson and Kelling's article was quite compelling to communities trapped in upward spiraling crime waves. Before long, cities were eager to experiment with more community-oriented models of policing, especially with the tremendous federal dollars supporting COPS programs.

Kelling and Coles (1996) wrote the definitive book on the highly successful implementation of the "Broken Windows" model in New York City.[12] According to this model, police officers become enmeshed in a particular community or neighborhood. They build rapport with the community members, vigorously enforce order in the community, and encourage community members to assume responsibility for and control over their community. Police officers undertaking a "Broken Windows" or "Zero Tolerance" approach actively enforce seemingly minor violations, like smoking in public places and playing loud "boom-box" radios in subways. Kelling and Coles envisioned this approach as an immediate, short-term solution

[12] The model implemented in New York is interchangeably identified as "Broken Windows" and "Zero Tolerance" throughout most of the literature.

that would seize control of a troubled neighborhood and encourage development of community cohesion. The community would then be able to rely on this cohesion to maintain long-term control over the neighborhood.[13]

Trojanowicz and Bucqueroux (1990) offered a complementary perspective known as "Community Policing." Their theory, most commonly associated with the Los Angeles Police Assisted Community Enhancement (PACE) program, is a complex model which essentially positions police agencies as the leaders in multi-system approaches to addressing crime problems. Police officers serve as community ombudsmen and should be granted enhanced autonomy to address neighborhood-specific problems in creative ways. The broad and expansive role of community police officers is best depicted in the following passages:

> The police, as the only social agency open around-the-clock every day of the year, are the most logical, most powerful, and most respected candidates for the job of harnessing and directing people's efforts in addressing crime, fear of crime, social and physical disorder, and neighborhood decay. Within the limits imposed by their role, they must move beyond responding to calls as isolated incidents, to identifying and altering the underlying dynamics that create the social and physical environment that allowed the problem to occur (Trojanowicz and Bucqueroux, 1990,p. 367).

Of particular importance to the Community Policing model is the concept of customer satisfaction. Trojanowicz and Bucqueroux see police agencies competing for budget dollars both

[13] While the New York City model was highly successful in lowering crime rates, there have been several subsequent critiques of the model. Those critiques focused on the impacts of aggressive arrest policies on minorities and on the excessive burdens placed on courts due to the large influx of petty offenders.

with private companies and with other public agencies. For that reason, agencies must concentrate on providing the desired level of service to voters and taxpayers. Ironically, this model also suggests community interaction will take precedence over more traditional police functions. As a result, response times to non-emergency calls may be slower and business interests may suffer a lowered level of service. Community Policing may also reduce the power and influence of political leaders as the empowered masses flock instead to their Community Police Officers for assistance.

The third brand of Community Era police styles is found in Goldstein's (1990) work entitled *Problem-Oriented Policing*. This strategy is similar to Broken Windows and Community Policing and, in many ways, serves as a middle ground between them. According to Goldstein, most community-based strategies include some problem solving elements typical of this strategy. The overall goal of a Problem Oriented Policing approach is to shift officers' roles from handling incidents to handling problems. Once the problem-oriented police officer identifies a problem, he must be encouraged to thoroughly analyze the problem and to examine alternative solutions to the problem. Instead of merely arresting or investigating one's way out of a problem, the problem-oriented police officer will pursue alternatives like targeting enforcement against repeat offenders, coordinating multi-agency responses, reporting hazardous situations to responsible authorities, and utilizing civil court systems to address nuisances .[14]

[14] There are many critiques of community-based strategies. Some focus on its misplaced emphasis on reducing fear of crime in lieu of actually addressing the reality of crime. Others center on the ability of officers to freely trample individual liberties as part of their broadened social control role. See Greene and Mastrofski (1988) for a more detailed discussion of these critiques.

Of relevance to the present issue is the critique that Community Era strategies are manpower intensive and, as a result, costly. Quite simply, it takes more police officers to respond to every minor nuisance than to focus on reacting to specific high-priority crimes. It takes more police officers to cover an area on foot than in a patrol car. It takes more time to handle a problem than to merely respond to and document a reported incident.

As pointed out by Donohue (2007), the federal government distributed almost $1 billion per year to state and local agencies for the purposes of hiring the additional police officers needed to accomplish COPS program goals. And, this did not account for all of the drastic increases in police employment and expenditure funded by state and local tax dollars as well. Furthermore, additional police officers inevitably require additional equipment and support staff, much of which was funded by the federal Making Officer Redeployment Effective (MORE) grants (Muhlhausen, 2006).

Even the most ardent supporters of Community Era strategies were unable to demonstrate a sustained impact by those extra police officers. Once hiring levels peaked in 1999, agencies were able to dramatically decrease staffing levels without having any noticeable impact on crime rates (Donohue, 2007). In many ways, this supports Kelling and Coles' proposal that Broken Windows is a short-term catalyst intended to serve as a catlyst for community-based solutions to crime problems. Muhlhausen (2006) found that the COPS hiring grants, which represented the largest portion of the overall program, were the least effective in achieving crime reduction goals. Alternatively, Muhlhausen found the smaller innovative grants, such as domestic violence programs or youth firearm initiatives, produced positive returns. This finding neatly leads to an

upcoming era of policing that relies on identifying key strategic points for agencies to focus their efforts.

**The Intelligence-Led Era of Policing**

One critic of community policing strategies analogized the underlying premise with 'putting pain killers in the public drinking water to reduce headaches in the population at large" (Mastrofski, 1988, p. 59). The strategies are frequently seen as resource-intensive and lacking the focused direction needed to address the realities of crime. It is not surprising that the most recent shift in policing strategies emphasizes precise use of dwindling resources and a narrowing focus toward addressing specific elements of criminal activity.

Intelligence became the national buzzword after the terrorist attacks of September 11, 2001. This new emphasis on intelligence went well beyond national security, and quickly began to dominate discussions on crime control and policing. The Community Era's initial success in thwarting the crime waves of the late 1980s had begun to wane by the late-1990s. And, the manpower-intensive operations of the Community Era were quickly draining state and local budgets as federal funds shifted from domestic crime to national security. Police agency scandals began to emerge, ranging from the resurgence of racial profiling to the manipulation of crime statistics designed to mislead the general public. It has started to become clear that the United States is beginning to embark on yet another era of policing.

In August of 2002, the Department of Justice funded a Criminal Intelligence Sharing Summit, hosted by the International Association of Chiefs of Police. This summit led to development of a national plan for intelligence-led policing. While much of the plan was

dedicated to outlining guidelines for regional and national data sharing, one element specifically addressed modification of local agency organization. The plan called for agencies to train intelligence officers who would be responsible for ensuring information was spread both horizontally and vertically within the agency. The emphasis was on ensuring information got to the people who needed it the most.

In 2005, the Bureau of Justice Assistance published a detailed report on designing local agencies' intelligence architecture (Peterson, 2005). The report emphasized the utilization of strategic intelligence as opposed to tactical intelligence. Tactical intelligence, such as crime scene evidence or witness statements, assists with specific investigations. This has been the forte of policing since the Professional Era. However, the new approach centers on a different variety of intelligence. "Strategic intelligence deals with 'big-picture' issues, such as planning and manpower allocation" (Peterson, 2005, p. 1). A primary element of strategic intelligence is crime trend analysis, which helps agencies quickly identify patterns and emerging trends so resources can be reallocated to address problems early.

Intelligence-Led Policing does not eliminate strategies utilized during the Community Era. In fact, the Bureau of Justice of Assistance recommends that agencies utilize patrol officers as information-gathering resources within their patrol area or beat. Field officers play an important role in giving meaning to the problems and crime trends identified by analysts. However, the shift toward intelligence-based strategies redirects much of the community police officer's social role toward agencies outside of the law enforcement structure. One example

includes referring domestic disputes to domestic violence case workers. Another example includes use of mental health response teams to handle calls on mentally disturbed persons.

In September of 2006, the New Jersey State Police publicized its pioneering movement toward an Intelligence-Led Policing design. In conjunction with the Center for Policing Terrorism at the Manhattan Institute, the agency published its thirty-seven page guide for establishing this design. The guide emphasizes utilizing field personnel as primary data collectors, crime analysts as information coordinators, and agency leaders as resource allocators. The focus of Intelligence-Led Policing is on developing agency-wide situational awareness that is derived from data warehousing, broad-based analysis, and interpretive inputs from all levels.

Two of the primary elements of Intelligence-Led Policing include crime analysis (Lambe, 2008) and geographic information systems technology or "GIS" (Cook et al., 2008). Crime analysis is a field dominated by civilian personnel utilizing statistics-based trend analysis. GIS is a field dominated by civilian technical personnel utilizing computerized mapping systems. Unlike the need in the prior eras for specialized police officers, much of the focus of this approach is on specialized civilian operators. For agencies struggling with the realities of recruiting armed first responders, this shift offers a welcome alternative.

Michael Barrett (2006) presents the argument for Intelligence-Led Policing in a slightly different light. He suggests that communications and technological progress have increased the productivity of criminal elements. Modern criminals are becoming more sophisticated and operationally agile. Modern law enforcement must respond in kind. For Barrett, resource allocations must be based on improved awareness of the operating environment. Law

enforcement leaders must optimize their crime control strategies, including the allocation of manpower and resources.

Intelligence-Led Policing emphasizes the use of technology, analysis, situational awareness, and targeted enforcement. The efficient allocation of police resources, including manpower, is a critical component of the strategy. This strategy falls neatly into line with the modern concept of strategic management, a term that has recently come into play within the law enforcement community. Charrier (2006) discusses the need for law enforcement agencies to employ strategic management principles. While her specific focus is on explaining the role of a strategic manager, the overall application of strategic management to law enforcement agencies fits well with the intelligence-led policing strategy.

Two aspects of strategic management are of importance to staffing issues within police agencies. First, strategic management involves utilizing research to identify needed adjustments in organizational designs. As agencies move from the manpower-intensive community strategies to the more streamlined intelligence strategies, it is clear considerable re-organization will be necessary. Second, strategic managers, "Identify proactive approaches to issues through trend analysis and predictive indicators" (Charrier, 2006, p. 61). While manpower-rich community oriented-agencies could afford a broad, indiscriminate approach to crime prevention, the more streamlined environment found in today's agencies calls for the more targeted approaches made possible in an intelligence-based agency.

**Summary of the Policing Eras**

Determining manpower levels largely depends on the type of policing being practiced at the time. As I have discussed in this section, policing strategies are cyclical. It is interesting to note the patterns evidenced by these eras. During the Watchman or Patrol Era, the emphasis was on using highly visible police officers to deter criminals and maintain social order. More police officers led to more deterrence, less crime opportunity, and greater social controls. Systemic abuses of authority, substantial political manipulation, and rising costs led to the Professional or Reform Era. During this next era, the emphasis was on using a highly trained and elite police force to fight crime through advanced investigative techniques. Resistance to the politically insensitive agencies, coupled with a growing divide between officers and the community, led to the Community Era. This era harkened back to the nostalgia of the Watchman Era and relied on police officers to address broad social ills. Just like its ideological predecessor, the manpower-intensive community-based strategies have begun to wane in the face of abuses, politics, and rising costs. We are now enmeshed in a difficult transition from the highly popular concept of Officer Friendly in every neighborhood. The fourth era, Intelligence-Led Policing, appears to return to the ideological roots of the Professional Era. An emphasis on science and technology has returned to the forefront, and the shift is from scores of Officer Friendlies walking the beat to an elite corps of computer-savvy cops in computer-equipped cruisers. This new era shifts the manpower focus from numbers to sophistication.

As I indicated in the section on staffing levels, the bulk of early research on police agency size occurred during the early years of the manpower intensive Community Era. The

shift toward a more streamlined allocation of resources, as expected in the Intelligence-Led Era, brought renewed interest and new research to this critical field.

## Literature on Government Budget Systems

*Never base your budget requests on realistic assumptions,*
*as this could lead to a decrease in your funding.*
*-Scott Adams, "Dilbert"*

Davis, Dempster and Wildavsky (1966) persuasively demonstrate that the United States government budgeting system relies on incremental, line item budgeting, with last year's budget used as the foundation for next year's budget. Their research still rings true today, with the Government Finance Officers Association (2014) affirming that the traditional government budget system in today's economy continues to be incremental in nature. For police agencies, this translates into staffing decisions based on incremental growth or reduction. Rather than identifying ideal staffing levels and developing a plan to reach those levels, cities are more apt to simply add or decrease staffing levels by an arbitrarily derived percentage. Levitt (1997) demonstrated quite clearly how staffing level changes are closely tied to election cycles, with additional positions funded immediately preceding mayoral or gubernatorial elections. Chalfin and McCrary (2012) suggest that police staffing levels are more tied to fiscal crisis, bad luck, budgetary mismanagement, and political gamesmanship than to actual crime. From this perspective, understanding police staffing from a budgetary standpoint becomes critical.

Chalfin and McCrary (2012) approached the issue of police staffing levels from a unique perspective. They offered a complex econometric analysis of the value added by additional police officers. Their study examined 242 cities with populations greater than 50,000, spread

across 45 states and the District of Columbia. Departing from traditional analysis techniques, Chalfin and McCrary use the Annual Survey of Government to convert police officer positions into a monetary value. They then examine the impact of every dollar spent on police officers in relation to every dollar lost to crime. Their overall finding suggests society receives approximately $1.60 in benefits from each additional dollar spent on police personnel. The impact was greatest for violent crime, especially murder and robbery. With the exception of motor vehicle theft, property crimes were impacted at a much lower rate than violent crimes, but still experienced a negative and significant relationship.

The Chalfin and McCrary study demonstrates the strong link between budgetary considerations and police staffing levels. Its utility is best understood in the context of a brief overview of budget styles.

As early as the 1920s, the incremental budgeting system used by most government agencies was called into question. The line item budget used by most agencies, both then and now, offered a simple method for governments to allocate funds to a wide range of diverse agencies. This type of budget is essentially an accounting ledger grouping categories of expenses with little or no explanation of the purpose or objective the items are intended to achieve. Of course, most career government employees will testify that the simplest way to create that line item budget is to build on the prior year's budget. Thus, the line item budget is almost always incremental in nature. In 1924, Upson pointed out that line item budgeting failed to properly assess the efficiency and public value of budgeted items. Since then, numerous attempts have been made to transition government agencies to budgeting systems that were more

outcomes oriented. These attempts have largely failed, and most governments continue to rely on the incremental, line item system due to its simplicity (Government Finance Officers Association, 2014). However, as demands for transparency and accountability continue to grow, government agencies are being constantly pressured to demonstrate a greater nexus between their budgets and their outcomes. A brief historical survey of the various types of budget strategies will help demonstrate the potential benefit of non-incremental budgeting styles for police agencies attempting to develop a police personnel budget.

Public demand for budget reform began to surface in the 1940s. The first alternative budget style to emerge was Performance Based Budgeting. This budget system attempted to distribute funds according to results and accomplishments instead of to specific functions. At the heart of Performance Based Budgeting was the conversion of inputs (funding) to outputs (results). This approach gained significant attention in 1949 when The Commission on Organization of the Executive Branch of the Government recommended adopting this strategy for federal agency budgets. However, the approach proved unwieldy and difficult to implement, largely due to difficulties with output measurements (Miller, 1996). With no standard, pre-determined formula linking dollars and specific results, budget authorities faced an insurmountable burden attempting to identify and quantify those fiscal links. Studies, such as Chalfin and McCrary (2012), could serve to make Performance Based Budgeting a more feasible approach in 2012 than it was in 1949.

By the mid-1950s, attention was shifting away from performance budgeting simply because it had proven too difficult and unwieldy to administer. Program Budgeting was the

next alternative that emerged (Burkhead, 1961). In Program Budgeting, funds are allocated based on the value and/or demand for specific programs. This form of budgeting was designed to allow greater flexibility for long-range projects than the Performance Based Budget system. It was also infinitely simpler to develop and administer. However, Miller (1976) points out that the Program Budgeting movement apparently got lost amidst the other strategies emerging at the time. Unfortunately, none of the subsequent strategies offered the simplicity of the Program Budgeting approach.

In the 1960s, the Planning, Programming, Budgeting System (PPBS) gained attention when the Department of Defense successfully adopted the system (Mosher, 1969). The concept of PPBS attempted to merge planning, program development, and budget systems into one process (Miller, 1976). Planning identified goals, programs defined objectives, and budgets estimated the costs associated with implementation. As a result of the system's success at the federal level, the Ford Foundation funded testing of PPBS in fifteen state and local government agencies (Schick, 1971). The experiment largely failed, and few agencies continued using PPBS beyond the test period. Schick suggests some elements of PPBS were permanently incorporated into state budgets and, to a lesser degree, into local budgets. However, he cautions that many states claiming to use PPBS strategies were not genuinely incorporating those strategies into the decision making processes. Mosher (1969) suggests the inability of state and local government to effectively implement a Department of Defense PPBS model centered on the non-federal agencies' lack of familiarity with and experience in cost effectiveness studies. Without the resources needed to conduct in-depth and costly studies, PPBS proved ineffective and

impractical for government agencies. As with Performance Based Budgeting, the problem again centered on the need for preliminary planning assessments that were beyond the reach of most state and local governments.

In 1966, Davis et al. determined that city and state governments had largely returned to the incremental, line-item style of budgeting. Despite numerous attempts to develop a more efficient alternative, the budget strategies attempted during the 1940s through 1960s had failed due to their complexity. Once again, in the 1970s, another budget strategy emerged. Zero-Based Budgeting (ZBB) enjoyed short-lived popularity during that decade (Shelby, 2013). The goal of ZBB was to eliminate the incrementalism highlighted by Davis et al. in 1966. In ZBB, an agency must justify its funding requests each year, starting from what the agency could achieve with zero dollars up to what the agency could achieve with its funding maximum. As with PPBS, the ZBB budget strategy focuses on funded objectives that were tailored to accomplish specific goals. However, ZBB adds an additional complexity by expecting administrators to predict goal achievements at numerous different funding levels. Unlike the highly popular and simple line item budget, ZBB requires starting from scratch every year. Like its predecessors, ZBB faded quickly due to its inherent complexity for budget authorities and administrators (Shelby, 2013).

After four decades and four failed budget strategies, government agencies during the 1970s and 1980s resorted to their familiar line-item, incremental budget (Hyde, 1991). However, by the 1990s, a new push began for greater accountability in the budget process. Osborne and Gaebler's highly acclaimed 1992 book, *Reinventing Government*, drew tremendous

attention to the concept of results-oriented budgeting as a means of increasing government's accountability for achieving tangible results. Numerous short-lived revivals of the budget systems of the 1940s through 1960s occurred. But, as with the earlier attempts, those systems proved to be unwieldy and too complicated for widespread implementation. So, as the Government Finance Officers Association (2014) affirms today, the traditional government budget system continues to be incremental in nature.

While the public seeks greater accountability in government budgeting processes, it has proven difficult to develop a budget system that can offer that accountable in an efficient manner. Mosher's guidance in 1969, however, offers the best explanation of the underlying deficiencies that have historically made alternative budget systems impractical. State and local governments lack the resources needed to do extensive cost effectiveness studies. Remedying this deficiency with academic studies, such as the Chalfin and McCrary value-added analysis of police officers, could prove to be the turning point in budget reform.

Kavanagh, Johnson and Fabian (2011) offer the most recent budget strategy proposed for state and local government agencies. Priority-Driven Budgeting (PDB) has been suggested as an ideal strategy for cities dealing with economic hardship. Rather than the lofty designs of earlier budget systems, largely designed without a finite spending cap during the early stages of the process, PBD requires a very pragmatic first step: identify available revenues. From that point, priorities are identified, defined, evaluated, scored, and compared in order to determine appropriate allocation of resources. As with all of the other budgeting systems examined, the

complex analysis required to define, evaluate and score each priority could prove to be this system's weakness.

For police agencies, one of the most difficult problems faced during the budget process is determining how many officers the agency needs to accomplish its goals. Of all the budgeting systems, this newly developed PDB strategy may prove extremely beneficial for police agencies. Public safety is generally a high priority item for most local governments, and a budget that emphasizes funding based on priorities should be every police administrator's dream come true. However, if agencies are unable to simply and systematically specify how their large personnel budgets achieve crime reduction goals, this tremendous opportunity to pursue an ideal budgeting system may be lost.

My attempt in this dissertation is to identify an optimum staffing level range for urban and suburban police agencies is an important first step that will facilitate and simplify the PDB process. For police administrators, incremental budget systems lead to staffing levels that are largely idiosyncratic and based more on political shifts than on crime trends (Chalfin and McCrary, 2013). However, by offering readily-available staffing level range guidelines, this dissertation and subsequent follow-up studies will facilitate the shift toward budgeting systems that are based on priorities and offer greater accountability than the current incremental system.

## Literature on Police Effectiveness and Management

*Police officers may drive black and white cars.*
*However, what goes on in their job is a lot of gray.*
*- Arik Matson*

Bayley (1994) points out that for every one hundred officers, less than twelve are deployed on the street at any given time. He achieves this figure by first calculating the percentage of officers assigned to patrol functions (between 60 percent and 70 percent). Assuming the most beneficial figure of 70 percent, he then calculates the percentage of officers assigned to each eight-hour shift. This translates into approximately 17.5 percent of the department available for patrol during any given shift on any given day. Bayley then accounts for days off, sick leave, training time, vacation time, and other absences to arrive at an average estimate of 11.7 percent of the department available for patrol during any given shift. His research leads to the suggestion that marginal increases in manpower yield almost imperceptible increases in visibility.

From Bayley's research, it is easy to see why research into the impact of increased manpower on crime rates is so inconclusive. A city that funds one hundred additional police officers encourages the public to envision one hundred uniforms flooding the streets. Yet, Bayley's research demonstrates that increase is likely to yield less than a dozen officers at any given time spread across multiple precincts. In mid-sized cities, this may translate into one extra team working an area. In larger cities, this may only translate into one extra officer shared between several precincts.

O. W. Wilson (1977) recognized the need to examine the effect of preventive patrol in order to determine base staffing levels. The importance of this examination becomes even more important in light of Bayley's demonstration that a tremendous manpower increase would be necessary to achieve even small increases in preventive patrol visibility.

Kelling et al. (1974) conducted exactly the type of research indicated by Wilson. In the Kansas City Preventive Patrol Experiment, Kelling et al. conducted a controlled operational experiment for one year. This type of experiment is difficult to coordinate in a public safety environment, so the research is considered unparalleled in its methodology. Three different patrol levels were used for the research. One area was designated as reactive only. Officers stayed outside of the area unless a call for service was received. Obviously, this area had only minimal visibility. The second area was designated as proactive. Police presence in this area was increased two to three times the normal level. This area was considered to have maximum visibility. The third area was designated as the control. Normal levels of patrol were maintained in this area, presumably resulting in normal or traditional levels of visibility.

The Kansas City experiment yielded several very important findings. As stated in the summary of findings, "decreasing or increasing routine preventive patrol within the range tested in this experiment had no effect on crime, citizen fear of crime, community attitudes toward the police on the delivery of police service, police response time, or traffic accidents" (Kelling et al., 1974, p. 14). Data examined included victimization surveys, reported crime, rates of reporting crime to the police, arrest trends, citizens' fear of crime surveys, protective measures used by citizens, protective measures used by businesses, community attitudes toward the police,

businessmen's attitudes toward the police, estimates of citizen-police transactions, police response time, and traffic incidents.

Of tremendous importance in this study was the analysis of patrol officer time. In all three groups, the percentage of non-committed time[15] ranged from a low of 59.31percent in the proactive group to a high of 62.27 percent in the reactive group. The study specifically cautioned against using its findings to simply slash police agency size. Instead, it suggested that agencies needed to find the most productive ways to utilize that large portion of non-committed time. Consistent with the emerging philosophies of that time, the researchers suggested dedicating the non-committed time to community interaction. And, as policing enters the more strategic intelligence-led era, it is logical that the significant non-committed time may be best used to focus on targeting specific areas or activities identified through crime trend analysis.

Interviews with officers offered an interesting result. Over 80 percent of patrol officers interviewed agreed that patrol was the most important function in the police department. However, the majority of those officers also indicated they believed patrol in unmarked cars or in plainclothes would be more productive in detecting and apprehending criminals. They believed the greatest benefits of highly visible uniform patrol were in reducing traffic accidents and enhancing citizen feelings of security.

It is not surprising that the research community responded to the Kansas City experiment by attempting to determine the best use for that large portion of non-committed patrol time.

[15] Non-committed time is defined as patrol time when not answering calls. For purposes of the Kansas City Preventive Patrol Study, this was considered the time available for officers to conduct preventive patrols in targeted areas.

Wilson and Boland (1978) examined the impact of aggressive patrol on robbery rates and burglary rates in thirty-five large cities. They were clear that the term aggressive in this context was not intended to reflect hostility or abusiveness by officers. On the contrary, the term was used to describe proactive patrol that had a high incidence of citizen contact through traffic stops and field interviews. After controlling for socio-economic factors and political culture, they determined that aggressive use of non-committed patrol time (as evidenced by the number of traffic arrests) had a significant impact on the likelihood of effecting robbery arrests and, as a result, for deterring robbery offenses. No such correlation was found for burglaries, a finding Wilson and Boland believed was due to the stealth aspect of that particular offense. In 1980, Sampson and Cohen replicated this study with similar findings. A critical component of this line of research was its emphasis on comparing different agencies in an effort to examine underlying structural and managerial components.

Jacob and Rich (1981) researched the issue of proactive patrol on robbery arrests and incidents with far different results. They, however, examined changes within cities as opposed to changes across cities like previous studies. This distinguished their work in that it did not take into account the political culture and organizational structure that Wilson and Boland examined.

Koper (1995) approached the non-committed patrol time from another angle. He examined the impact of proactive field stops on observations of disorderly behavior in a year-long study conducted in Minneapolis. This study determined that a patrol stop lasting eleven to fifteen minutes offered optimal effects on reducing disorderly behavior in the immediate vicinity.

Koper did not examine the deterrent impact on particular crimes; rather, he proposed that moderate-length proactive interactions offered the optimal mechanism for achieving results consistent with Broken Windows Theory. He suggested that agencies would be best served by targeting crime hot spots and incorporating surges of proactive patrol at random intervals. As did the researchers associated with the Kansas City experiment, Koper found no benefit associated with the mere visibility of marked police cars passively patrolling a neighborhood. Rather, his approach emphasized aggressive patrol in hot spots.

This line of research points to one primary issue. Police officers assigned to patrol duties have significant non-committed time. Rather than simply attempting to reduce crime by increasing the number of officers on patrol, agencies are best advised to focus on maximizing the utility of that large block of non-committed time. Famega et al. (2005) confirmed the earlier findings that patrol officers have large blocks of available time for pursuing proactive approaches. While recent strategies like Problem Oriented Policing anticipate using non-committed time for proactive activities, the reality does not conform with the theoretical strategy. Famega et al. found that most of the officers' non-committed time was not directed. In those instances where direction was offered, it was generally task oriented. Officers were instructed to write tickets, be visible in a particular neighborhood, or crack-down on street corners. Supervisors rarely presented goal-driven directives to patrol officers, and officers rarely undertook proactive activities consistent with big picture goals. For Famega et al., the problem was not with the number of police officers in the field. The problem was one of supervision.

Herndon (2005) provides recommendations for addressing the problems pointed out by Famega et al. He proposes a simple method for calculating a productivity ratio for each officer. First, agencies must establish reporting standards and devise forms to collect the necessary data. Calls for service, miles driven, and self-initiated activity are used to calculate an officer's or platoon's total patrol activities. That number is then divided by the total number of hours actually worked, excluding time in court and other non-patrol details. This ratio of total activity to hours worked represents one potential method for evaluating officer productivity.

The problem with the Herndon approach is that it does not distinguish between time-consuming activities, such as a DWI or felony arrest, and quicker activities, such as a traffic ticket or a misdemeanor arrest. However, the broad concept does offer some direction for future research aimed at determining productivity standards for officers. Because the research shows tremendous downtime for patrol officers, future efforts should be directed toward refining the Herndon formula in order to maximize officer efficiency and determine productive staffing levels for agencies.

Before leaving the topic of police effectiveness and management, it is important to recognize that agencies must not only adopt staffing levels and management practices geared toward addressing crime. Emergency response is undeniably one of the most important roles police officers play in society. While visibility may not substantially impact crime, availability is a critical component of the broader public safety directive. Whether or not police presence can cause decreases in crime, the public demands that officers serve as readily available first

responders. For this reason, response time must be considered in any assessment of police manpower strength.

Pate et al. (1976) relied on data from the Kansas City Preventive Patrol Experiment to evaluate the impact of response time on outcomes, citizen satisfaction, and general attitudes toward police. The study concluded, "the difference between expected and observed response time was the most significant predictor of citizen satisfaction with response time" (Pate et al., 1976, p. 49). Based on this finding, the researchers recommended that dispatchers prioritize calls needing immediate response and that call takers advise citizens of estimated wait times on non-priority calls. Further findings indicated that outcome of the encounter was more important to citizens than response time. A slower response time followed up by courteous interaction and thorough investigation was far more effective than a response that was simply quick without any degree of thoroughness.

This finding does not suggest that agencies can sacrifice patrol officer strength. No part of the research examined whether extensive hours-long delays in response time would be tolerable. Rather, the study examined only marginal differences ranging from one minute to roughly a half-hour. This finding also did not suggest that response time was irrelevant in a life or death situation, such as a riotous outbreak or a severe motor vehicle crash. However, the managerial relevance of the study meshes well with research on patrol effectiveness. Thorough address of the problems identified in a call for service is far more valuable than minimizing citizen wait time.

Agencies often allocate manpower based on geography. This is not unreasonable in light of the Pate study's finding that distance was closely associated with response time. However, recent technology is improving the ability of managers to approach their patrol deployment with greater flexibility and effectiveness.

Sacks (2000) offers one such technology-oriented approach. He utilizes four criteria for determining optimal spatial deployment of patrol cars. These criteria include response time, workload balance, patrol frequency per square mile, and inter-district dispatches. His computer model accepts inputs relevant to these criteria and draws optimal patrol district boundaries based on those inputs. While the computer is no substitute for managerial discretion, it does offer an automated mechanism for evaluating those critical determinants.

Another technology-oriented approach that has gained considerable favor is the use of geographic positioning systems (GPS) installed in patrol cars for displaying vehicle locations on dispatcher console maps. This allows dispatchers to visually pinpoint each available patrol vehicle's instant location as it relates to the call for service being dispatched. Many off-the-shelf products even identify the best car option for dispatchers, based on the actual distance and road conditions of available routes.

To summarize the literature on police administration and management, merely increasing visibility by placing more officers on patrol is an ineffective response to crime problems. A significant portion of patrol officer time, generally around 60 percent, is non-committed and relatively undirected by supervisory personnel. Agencies wishing to impact crime should focus less on dramatic increases in manpower and more on better utilization of patrol officer non-

committed time. That utilization should be coordinated as an explicit response to information gathered through crime trend and GIS analysis. Calls for service are an important element of patrol, and research indicates citizens are most satisfied by thorough incident handling. Response time in non-emergency situations is of far less importance than solid on-scene investigation. Recent technological advances offer alternatives to the static geography-based manpower allocations. These technologies allow flexibility in determining district patrol boundaries and optimization of patrol response time through dispatch of the nearest available car.

## Summary of Literature Review

The belief that police officers can impact crime rates is primarily based on the Classical Deterrence Theory of criminal behavior, as well as its modern offshoot, Rational Choice Theory. Under those theories, police officer actions serve as a disincentive for pleasure-seeking, rational individuals who are contemplating criminal activities. In order for these theories to impact future law breakers, police officers must apprehend violators swiftly and with certainty. Punishment is a large part of deterrence-based theories; however, that aspect is conducted at later stages of the criminal justice process.

A secondary theory which may also fuel the link between police officers and crime rates is Routine Activities Theory. The role of police officers in this ecology-based theory is to serve as a guardian, disrupting the convergence of a motivated offender, a susceptible target, and the absence of a guardian. This theory emphasizes police visibility within the community rather than arrest and apprehension.

There is little consensus in the literature on whether or not police agency staffing levels have an impact on agency effectiveness in reducing, stabilizing, or otherwise controlling crime rates. The small body of available studies is similar in several important ways: researchers generally utilize small samples that are non-random, they generally overlook agencies with less than 1 police officer per 1,000 residents, they focus on cities with populations greater than 50,000, and they treat mega-cities of over 1,000,000 residents the same as smaller cities with 50,000 residents. A recent group of studies between 1997 and 2002 successfully found a small, but significant, negative relationship between staffing levels and crime rates. These studies have opened the door for further inquiry; however, considerable research will be required to authoritatively demonstrate that more police officers lead to less crime.

The most recent study on the link between police staffing and crime is the Chalfin and McCrary working paper that attempts to examine the relationship from an economic standpoint. Crimes are attributed dollar-value costs while police officers are measured in dollar-value units representing the cost per officer to a city. This approach emphasizes the budgetary considerations that frequently drive police staffing decisions. The most practical implication of this type of value-added police staffing research is its ability to facilitate a transition from the traditional line-item budget method to one of the more productivity-oriented budget methods. Priorities-Driven Budgeting (PDB) offers a modern budget strategy that could prove beneficial for high priority public safety functions. However, in order to ensure the success of a PDB strategy, administrators must have ready access to simple, easy-to-use staffing guidelines such as those offered by this dissertation.

The lack of consensus on whether police officers impact crime may also be attributed in part to the dramatic shifts in resource allocation during the identifiable policing strategy eras. While the manpower-intensive Community Oriented Policing Era was associated with national crime reductions, it was impossible to disentangle the impact of more police officers from the impact of other crime-fighting resources that were being rapidly deployed during that same time frame. The extravagant expense associated with the Community Oriented Policing Era strategies has proven unsustainable during changing economic times and, as a result, a more streamlined era has begun to emerge. This new era, commonly called the Intelligence-Led Policing Era, focuses on a more restrictive police role designed to streamline staffing and reduce agency expenditures. This shift to a new era has caused administrators to seek staffing levels that are optimized to achieve targeted crime index reductions. By examining the role of police agency staffing levels during this newly emerging era, the potential for finding a more predictable pattern is enhanced.

# CHAPTER 3

# METHODS

Guffrey (2009) conducted the only study that examined optimum staffing ranges. His question was whether cities with high ratios of officers to citizens experienced a greater cost-benefit than cities with low ratios of officers to citizens. His study was preliminary in nature, examining only twenty-nine, non-random cities ranging in size from 25,000 to over 7 million population. Dividing them into three equal groups, he found evidence that cities with greater than four officers per 1,000 residents experienced diminished benefits from their higher staffing levels. At the opposite end of the spectrum, he found that cities with fewer than two officers per 1,000 residents spread their personnel so thin that cost efficiency was compromised. Guffrey's preliminary study opened the door for further inquiry into the highly relevant question he asked, "Is there an ideal staffing ratio for most cities?" (Guffrey, 2009, p. 122).

This dissertation will expand and build upon the basic concept addressed by Guffrey using a two-step process. First, I will use the Knowledge Discovery in Databases (KD) technique to uncover trends indicative of the proper ranges to be examined. Second, I will use Change-Scores Regression (Allison, 1990) to perform hypothesis testing for each of the ranges identified in step one.

**Hypothesis: Higher police-to-citizen ratios have a negative and linear relationship with crime levels.**

This dissertation will distinguish itself from similar studies by testing this hypothesis for three separate staff level groupings: minimally, moderately, and highly staffed. Guffrey (2009)

found that staffing levels were correlated with crime levels only in the moderately staffed group. Surprisingly, cities with higher staffing levels did not have any more or less crime than cities with lower staffing levels, nor did the higher staffing levels lead to subsequent crime rate reductions. Consistent with that finding, I expect staffing levels within the moderate ranges will have a greater impact on crime rates than either the minimally or highly staffed agencies. This dissertation will also distinguish itself from prior research by examining short term changes using multiple year-to-year time frames as opposed to single, multi-year time frames. Consistent with prior research of officer impacts on crime, an examination of impacts on both violent and on non-violent crime categories will be conducted.

**Step One: Determining the Staffing Ratio Ranges using Knowledge Discovery in Databases**

In order to fully examine the ideal staffing ratio question, the first step must be determining which staffing ratio ranges should be examined. Guffrey simply divided his small sample into three equal groupings. However, that approach could potentially overlook an optimal range that is not centrally located. With no research to provide guidance for this preliminary step, I turned to the Knowledge Discovery in Databases (KD), or data mining, technique. This technique extracts useful knowledge from large data repositories and uses statistical analysis to identify trends and recognize patterns. It is deductive in nature, which distinguishes it from the traditional inductive techniques used by most social science researchers.

Two considerations were critical for deciding to use the KD technique. First, KD is only being used as a preliminary method for determining the ranges which will be subjected to traditional hypothesis testing. Second, there is no research outside of Guffrey's very preliminary

examination of twenty-nine cities where an optimum range or level is identified. Because this dissertation is filling a very specific void in the literature, data mining was the only viable technique available.

KD is widely used in bio-medicine, astronomy, marketing, economics, and technology. In other areas of study, it is often referred to as data mining, information harvesting, or knowledge extraction (Fayyad, 1996). However, the technique has been slow to develop in the social and behavior sciences. Outside of the United States, KD is slowly emerging in sociology and psychology under the name data-driven research. Within the United States, it is beginning to emerge under the name data mining.

One of the earliest researchers to explore the ethics of data mining in psychology was Robert Rosenthal. He turns conventional wisdom on its head and bravely suggests that failing to "snoop" through the data is both bad science and bad ethics. The following quote from his 1994 article has been used repeatedly by social scientists advocating for more widespread use of data mining techniques.

> [D]ata are expensive in terms of time, effort, money and other resources ... If the research was worth doing, the data are worth a thorough analysis, being held up to the light in many different ways so that our research participants, our funding agencies, our science, and society will all get their time and their money's worth (Rosenthal, 1994, p. 130.)

Rosenthal sets the stage for a revolution in social science, and research pioneers began relying on that quote to more fully examine the ethics and effectiveness of Rosenthal's data "snooping" method. That method was subsequently renamed "data mining" in social science

circles, and has recently been recognized as a valid technique at the prestigious University of Chicago School of Sociology.[16]

Scime et al. (2008), like Rosenthal, suggest social science's reluctance to conduct data mining analyses is an ethical failure. They state, "Given the resources invested and potential for important findings, then, there is an ethical imperative to exploit these data to their fullest extent" (Scime et al., 2008, p. 309). They use data mining techniques to examine presidential vote choice and living arrangement outcomes for maltreated children. While their particular research findings are not relevant to this dissertation, their choice of meta-data and data-mining methods serve as an early example of the technique's use in social science research. According to Scime et al. large data warehouses are under-examined when traditional hypothesis testing techniques are used exclusively. As a result, traditional research misses "potential opportunities to shed light on some of society's pressing problems" (Scime et al., 2008, p. 308).

By 2013, Rahman and Ramos compiled a collection of articles on the use of data mining in fields that study society and human behavior. This marked a significant transition from the Scime, et al, solitary discussion of social science applications for KD to an entire book dedicated to meta data techniques in those fields. In their introduction, Rahman and Ramos discuss the multi-billion dollar investment in data warehouses throughout United States academic and government institutions. They suggest the massive investment in data inputs demands the efficient outputs data mining can provide. They even contend there is a strong obligation to

[16] The University of Chicago's School of Sociology states the following on its "Research: Sociology of Knowledge" webpage: "In typical Chicago manner scholars in the department employ an eclectic variety of methods to pursue their interests: various statistical and data-mining techniques are used alongside ethnomethology, participant observation, historical ethnography and historical comparative analysis."

thoroughly analyze the data that has been collected using meta data techniques like data mining. Rahman and Ramos believe that data sets contain answers to pressing societal issues, and they suggest it is unethical for researchers to shy away from fully analyzing data warehouses. They offer considerable support for their contention that data mining is largely ignored in the social sciences simply because most social scientists lack the skills or comfort necessary to work with meta data. While KD techniques are relatively new in the social sciences, modern researchers are beginning to recognize data mining is not only a valid technique, but it has also become an ethical imperative in today's research environment.

KD does not replace traditional research methods. Instead, it augments or enhances those methods. For that reason, it is important that social scientists use these techniques properly. Chung and Gray (1999) explain, "The objective of data mining is to identify valid, novel, potentially useful and understandable correlations and patterns in existing data" (p. 11). They clarify that the technique is useful for bottom-up research where raw facts are examined to find connections. KD is not a substitute for traditional scientific methods. Rather, it is a preliminary step used to identify trends which merit further scrutiny and testing. According to van Helden (2013), data mining techniques offer scientists a mechanism for formulating better and more relevant hypotheses. Van Helden stresses that the large data set analyses should not replace traditional hypothesis testing; rather, they help the scientist construct more precise hypotheses to be tested using traditional methods.

KD provides a productive and scientifically justified mechanism for identifying potential staffing level ranges for further testing in this dissertation. Kell and Oliver (2004) suggest KD

is most useful in a research field that is data-rich but hypothesis-poor. The study of police staffing and crime rates is data-rich, with extensive information available through federally-warehoused datasets. However, as Guffrey points out, there are no tested hypotheses offering guidance for researchers attempting to identify an optimum staffing range. This preliminary question is ideally suited to KD techniques.

A variety of statistical techniques are appropriate for identifying patterns using KD. According to Jackson (2002), correlation analysis is the appropriate technique when the ultimate goal is to determine if a change in the independent variable will result in a change in the dependent variable. Applying that technique, my first step will be to conduct correlation analyses on the large crime data warehouse in order to identify points at which a correlation between staffing level and crime begins to emerge.

**Step Two: Hypothesis Testing Using Change-Scores Regression**

Once staffing level patterns have been identified using KD, each set of potentially relevant staffing ranges will be divided into three groups: minimally staffed (smallest officer to citizen ratio), moderately staffed, and highly staffed (largest officer to citizen ratio). Regression analysis will be conducted on each of the three groups to determine the direction, magnitude, and significance of each staffing group's relationship to crime level. In this manner, this dissertation will identify the grouping(s) where police agency size has the largest impact on crime.

Traditionally, researchers have used the regressor variable method to examine this relationship. Applying that technique, we would regress crime rates in year two on crime rates in year one and police officer staffing level . This has been the traditional approach throughout

the earlier staffing level studies. However, this technique may be susceptible to Lord's Paradox. According to Lord (1967), the regressor variable method may produce nonsensical or inconsistent results when there are uncontrolled preexisting differences between the groups.[17] When conducting a time series analysis of crime rates, the researcher's efforts are complicated by the wide array of intervening variables that have created long-standing differences between different cities' crime rates. Guffrey (2010) offers a short list of variables that may lead to these fundamental differences: socioeconomic, cultural, education levels, employment rates, multiculturalism, and availability of drugs and handguns. This inability to define a limited group of intervening variables would suggest a Lord's Paradox problem may be contributing to the inconsistent findings experienced by researchers attempting to identify the nexus between police officers and crime.

To minimize the risk of Lord's Paradox in a study where there are pre-existing differences between the cases, Allison (1990) suggests a study design where more accurate adjustment can be made for prior differences. In these cases, Allison believes the change score method offers a superior and more accurate method.[18] In applying this technique, I will regress crime rates in year two minus crime rates in year one on police officer staffing level. In other

[17] The specific example used by Lord examined the effect of diet on weight gain for men versus women. In his example, one statistician relied on a standard t-test technique, which showed no evidence of a different weight gain between the two sexes. A second statistician relied on a regression technique to analyze the exact same data set. That statistician had a strong and significant finding that the diet resulted in more weight gain for men than women. According to Lord, each statistician used a proper and traditionally acceptable technique to analyze the data; however, the two techniques yielded opposite results. The paradox has been demonstrated to occur in instances where data treatments and techniques do not adequately account for baseline differences between the subjects.

[18] In the change scores method, the first year score is subtracted from the second year score and the difference, or "change," is used as the dependent variable. In traditional regressor methods, the second year score is the dependent variable, with the first year being treated as an intervening variable. The emphasis is on the change rather than on the second year's score in the change scores method.

words, I will examine the change in crime rates between the two years. Allison points out two tremendous advantages of the change scores method. First, he suggests the change scores method minimizes the impact of autocorrelation between the years, which arises in cases where the second year's score is heavily influenced by the first year's score. Second, he suggests the change scores method in social science applications is beneficially insensitive to measurement error and, therefore, reduces the need for corrections based on untestable or unrealistic assumptions. Because autocorrelation and measurement error are two of the greatest concerns in social science research, a study design that minimizes those impacts is highly desirable.

Guffrey (2010) suggests that study design and case selection are the most effective mechanisms for limiting the impact of an almost infinite list of intervening variables. In his research on the nexus between police and crime, Guffrey deliberately avoids introducing any intervening variables. Instead, he uses purposive sampling and small sample size to minimize those impacts. Allison (1990), however, suggests the change scores method offers an alternative approach that may prove superior in many social science applications. Unlike Guffrey's approach, Allison's approach is highly compatible with meta-data analysis and, as such, will be used for this dissertation.

## Summary of Methods

This analysis is structured to search for distinct empirical patterns in short-term crime rate changes and, more specifically, to assess the impact of police staffing levels as the cause of those changes. The research goal is to identify the point at which staffing levels become a reliable and significant predictor of crime reduction. Based on earlier research studies of the

nexus between police and crime, I anticipate only a small amount of the variation in crime will be explained or predicted by police staffing levels. However, a difference that is small but significant would still provide much-needed guidance to police administrators attempting to craft their annual staffing budgets.

In order to determine a standard baseline recommendation for police agency staffing levels, I first relied on the Knowledge Discovery in Databases (KD) or data-mining method to uncover correlation patterns between a wide range of police staffing levels and crime rates. Using information acquired from that preliminary examination, I tested separate regression models that identified low, medium, and high staffing level groups. Each of those groups for each of the identified ranges was subjected to regression analysis using the Change Score Regression method.

This two-step methodology is distinguishable from prior research on three grounds. First, I am evaluating per capita staffing levels with an emphasis on differentiating staffing shifts occurring in heavily-staffed versus lightly-staffed agencies. This will effectively identify a per capita staffing range within which the largest crime index reductions may be expected to occur. Second, this dissertation uses the KD method to distinguish heavily staffed from lightly staffed agencies. This is an improvement over Guffrey's size-based division, which could potentially camouflage an optimum range that was not centrally located near the overall average staffing level. Third, I use a Change Scores Regression method that limits the impact of intervening errors, reduces the impact of measurement error, and corrects for autocorrelation between each year's crime rates.

# CHAPTER FOUR

## DATA

I retrieved the data from the National Archive of Criminal Justice Data (http://www.icpsr.umich.edu/NACJD), a national repository for state and local information and statistics related to crime, victimization, and public safety agencies. The data repository relied on data from the Federal Bureau of Investigations' annual voluntary reporting program. The Uniform Crime Reporting Series (UCR) dataset and the Police Employee Data Publication were the primary sources used, with a small amount of missing police employee information retrieved from the report on Law Enforcement Officers Killed and Assaulted (LEOKA).

The UCR Series offers self-reported statistics on seven categories of criminal offense. Those offenses are divided into two categories. Violent Crime offenses include murder, rape, assault, and robbery. Non-violent Crime offenses include burglary, larceny, and motor vehicle theft. While reporting and participation in the program is voluntary, most federal grants are tied to UCR statistics. For that reason, participation is commonplace and over 2,500 local police departments participate in the program annually. The FBI estimates participation rates are approximately 95 percent. County-level crime statistics are not included in the UCR series unless the county boundaries and governance are contiguous with the municipality.

The Police Employee Report offers self-reported numbers of commissioned and non-commissioned personnel employed by local law enforcement agencies. Reporting is voluntary. An additional source of self-reported data for commissioned personnel strength is the LEOKA report. By using both of these resources, I was able to determine staffing levels for

approximately 90 percent of agencies that had participated in the UCR reporting program for each year analyzed.

## Time Period Analyzed

The time period selected for this research is 1999 – 2002. Three pairs of years will be analyzed: 1999-2000, 2000-2001, and 2001-2002. Most prior research in this area was conducted during the early 1990s, at the height of the Community Policing era. Because of the time during which that earlier research was conducted, two additional elements were intertwined with staffing levels. First, the 1980s and 1990s marked a major shift in policing paradigms as the nation moved from a reaction-oriented professional policing strategy that emphasized crime deterrence through apprehension toward a more proactive policing strategy that emphasized crime prevention through healing social wounds. Second, the 1990s marked a tremendous emphasis by the federal government on criminal justice expenditures. Donohue and Ludwig (2007) graphically paint the picture of multi-billion dollar criminal justice enhancement packages awarded to agencies throughout the early 1990s. While much of the additional money went toward increased staffing, considerable funding for equipment and other professional services was also generally included in these packages (Hughes, 2006 and Bauer, 2004).

There is little dispute that the Community Policing era offered marked declines in reported crime every year throughout the early 1990s. However, it is critical to recognize that this decline occurred during an era when the average number of police officers per capita grew enormously in most cities, when criminal justice expenditures skyrocketed, and when cities embraced the new Community Policing paradigm by infusing almost all social programs with an

ongoing police presence. It is virtually impossible to disentangle the impacts of more police officers on crime from the impacts of the additional funding and social services when examining the relationship during the Community Policing era.

My goal is to better isolate the impact of police staffing levels on crime by examining that relationship during a nationwide lull in the Community Policing programs. While it is clearly impossible to isolate staffing level impacts entirely, the years 1999-2002 offer a period of relative stability for research purposes. The infamous, ever-escalating COPS grants distributed during the height of the Community Policing era had begun to stabilize (Donohue and Ludwig, 2007). The feverish rate with which local law enforcement entered traditionally social service roles had also begun to stabilize. And, the dramatic increases in police manpower began a gradual retrenchment.

Donohue and Ludwig (2007, figure 1) offer a poignant graph showing changes in the nation's average number of police officers contrasted with changes in homicides per capita. From 1985 to 1999, the number of police employees increased both steadily and dramatically. By 1999, the nation boasted over five times as many police employees as in 1985. Between 1993 and 1999, the number of homicides per capita was cut almost in half. However, 1999 offered a very clear line where increases in police staffing levels stopped mirroring declines in homicide rates. From 1999 through 2005, staffing levels began a steady decline to levels consistent with those reported in 1985. However, despite the steady decline in police employees, homicide rates from 1999 to 2005 remained completely level and unchanged. This span of time represents an excellent opportunity to evaluate the current research question due to

the relative stability of overall crime trends contrasted with broad fluctuations in staffing levels. By selecting years within this time frame of 1999 to 2005, I will be afforded the best possible opportunity for isolating staffing levels as the most critical independent variable.

One of the biggest concerns with using a time frame of 1999 to 2005 is the impact of the World Trade Center attack on September 11, 2001. My goal was to analyze as many of the years within that time frame as possible without introducing enormous impacts on local law enforcement as a result of post-9/11 federal homeland security initiatives.

Davis et al. (2010) identified several ways the homeland security initiatives post-9/11 impacted local law enforcement agencies. First, they determined local agencies were pressured to participate in a variety of regionalized activities, such as threat assessments and counter-terrorism training. This placed new demands on those agencies and on their personnel. Second, they explained that traditional grant funding opportunities had shifted from hiring additional police officers to establishing multi-jurisdictional capabilities, such as consolidated communications centers or regional information sharing centers. Third, they suggested the emphasis on homeland security and counter-terrorism training, policy development, and philosophical shifts had failed to effectively integrate key policing trends, such as community policing, problem-oriented policing, or intelligence-led policing. In essence, Davis et al. painted a bleak picture of the post-9/11 impacts on local law enforcement. The U.S. Department of Homeland Security placed tremendous pressure on local agencies to shift their emphasis to counter-terrorism at the expense of traditional crime control, tapped local law enforcement officers to perform homeland security functions, and diverted funding opportunities from local

agencies to fund regionalized technology centers. Oliver (2006) even suggests post-9/11 begins an entirely new era of policing that is focused more heavily on homeland security than on crime. Because my goal in this dissertation is to examine staffing levels during a period of relative stability, I sought to ensure my time frame did not include the years when these large impacts were being felt by local agencies.

In order to determine when the impacts discussed by Davis et al. began, I researched the applicable post-9/11 legislation. Two laws, in particular, appeared relevant. First, on October 26, 2001, the USA Patriot Act (2001) was passed. This act offered a variety of investigative tools and enhancements to law enforcement. However, detailed reading of the provisions led me to conclude those tools and enhancements would require significant training, equipment, and information sharing networks before benefitting local law enforcement efforts. For example, the enhanced electronic surveillance provisions would immediately benefit federal law enforcement, which was already equipped and trained to undertake that type of activity. However, local law enforcement agencies routinely work a lower level of cases requiring less sophisticated technical support than their federal counterparts. As a result, those local agencies would not traditionally have extensive collections of electronic surveillance equipment at their disposal, nor were their personnel trained to legally and properly use that equipment. The need for training, equipment and information sharing networks would have resulted in a significant delay between implementation of the USA Patriot Act and applications of the Act's provisions by local law enforcement.

Second, on November 25, 2002, The Homeland Security Act of 2002 was passed. This act established the federal agency structures, funding, policies, and regulations needed to effectively coordinate federal, state, and local counter-terrorism efforts. Because this act set the stage for the federal government to offer tangible resources and support to local governments, I determined this act had a more direct impact on local law enforcement agencies. Burruss, Giblin, and Schafer (2010) discuss local law enforcement's transition into the post-9/11 policing model. Their study concludes agencies were most influenced by professional publications, government publications, sponsored training activities, professional associations, and peer agency pressures. The agencies were less influenced by grant funding opportunities, both immediate and long-term. Burruss et al. suggest the poor impact of funding on local agencies may be linked to the homeland security grants' emphasis on equipment purchases rather than on personnel and/or training. Because the type of institutional change advocated by Burruss et al. is a much slower-moving process than simply purchasing new technology, I determined this act from November 25, 2002, was likely to have a stronger impact on local law enforcement practices than the prior year's USA Patriot Act. Therefore, I decided to restrict my analysis to the years 1999 through 2002.

The selection of 1999 through 2002 is also consistent with and complementary to Guffrey's 2009 study. Because that study is the only one examining staffing level impacts on minimally versus highly staffed agencies, I sought to chose methods and time frames that would build upon and expand the existing research. Guffrey examines only two years, 1998 and 2003. My selection of the four years in between offers research that is consistent with the era

previously examined but complementary in its specific selection of the unexamined years bounded by Guffrey's research.

## Selection Criteria: City Size

City size has a strong impact on police agency organization. The FBI Uniform Crime Reports utilize six population cut-off points to group cities by size.

Table 4.1
City Size: Population Groups and
Average Police Officers per 1,000 Residents (1999)

| | Population | Officers |
|---|---|---|
| Group I | 250,000 and over | 3.2 |
| Group II | 100,000 - 249,000 | 2.0 |
| Group III | 50,000 - 99,999 | 1.8 |
| Group IV | 25,000 - 49,999 | 1.8 |
| Group V | 10,000 - 24,999 | 1.9 |
| Group VI | less than 10,000 | 3.1 |

A cursory examination of national trend data show that those cities in Group I with greater than one million population, as well as Washington D.C, have much higher per capita staffing levels than other cities within Group I. As a result of those mega-cities, Group I overall appears to have a higher median per capita staffing level than the other groups. However, when those mega cities are excluded from the analysis, the median per capita staffing level for Group I is the same as the Group II median. Based on this, I will eliminate cities with populations in excess of one million residents, as well as Washington D.C., from this analysis.

At the opposite end of the spectrum are extremely small cities. Information from the International Association Chiefs of Police indicates small city agencies (Groups V and VI) must function with dramatically different administrative and organizational structures than mid- and large-sized cities. The differences are so dramatic that the Association provides unique training tracks, technological assistance programs and best practices guides specifically geared toward local police departments serving cities with populations less than 25,000. While cities of 10,000 to 25,000 show median staffing levels comparable to the larger cities, there is concern that agency structure idiosyncrasies would render comparisons useless between these agencies. Thus, I elect to omit cities with populations below 25,000 from this research.

To summarize, the current study examines only cities with populations between 25,000 and 999,999 that are served by an identifiable local police department. Over 1,000 cities for each of the three sets of years analyzed fell within these population parameters. In order to control for city size and avoid the tendency of larger cities to overwhelm the statistical analysis, all variables will be measured in per capita units.

**Selection Criteria: City and Agency Stability**

City boundaries in many states are fluid. They may change through a variety of legal mechanisms, including annexation, secession, incorporation, and re-districting. These types of wholesale changes may result in dramatic, instantaneous effects that are more far-reaching than simply adding to or subtracting from the number of residents. Changes that impact population density, poverty levels, commercial vs. residential ratios, urban vs. suburban ratios, and other similar variables may be expected to have a far greater impact on per capita crime rates than

police staffing levels. These types of wholesale changes may also have substantial impacts on the nature and structure of police agencies. For these reasons, I eliminated cities with dramatic population shifts (in excess of 20 percent) as outliers in order to minimize the impact of large population shifts on changes in crime rates. Between 2 percent and 3.5 percent of cities were eliminated for year-to-year changes in population or staffing that exceeded 20 percent. I also eliminated Atlantic City, NJ as a dramatic outlier. Atlantic City boasted an officer-to-resident ratio of over 10 per 1,000 residents. The next highest officer-to-resident ratio in the studied group was 5.4 per 1,000 residents. Because the staffing level difference was so dramatic, I believed the agency structure and/or population dynamics in Atlantic City rendered it incomparable to the other cities. Monkonnen (1981) demonstrates quite clearly how city police departments throughout the United States have substantially similar structures, with only mild or moderate variation from one agency to the next. That premise is central to this dissertation, and including Atlantic City in the analysis would distort that fundamental similarity between agencies. Future qualitative examination of the specific structural and/or demographic factors leading to Atlantic City's unique staffing level may shed light on the overall staffing topic; however, it is not an appropriate examination to include in this dissertation's meta-data analysis.

## Independent Variable

The independent variable examined in this research is commissioned full time equivalent law enforcement employees per capita (police per capita). Earlier studies have relied on ratios of officers per 1,000 residents or officers per 100,000 residents. Because this dissertation

includes smaller cities in the analysis, ratios will be calculated based on a per-1,000 resident standard. Two possible methods for measuring police agency strength were considered.

First, I considered using the difference between staffing level strength in year one and staffing level strength in year two. This approach of using $Y_t - Y_1$ would have created a Difference-in-Differences (DID) estimation model.[19] The technique is rarely seen outside of the economics field. Since the subject of police staffing levels has a strong economic and budgetary component, I considered this technique. One of the crucial assumptions in DID estimations is that the paths followed by both the dependent and independent variables over time are parallel (Abadie, 2005). This dissertation failed to meet those assumptions in several ways. First, Corman and Macon (2000) discuss in depth the concept of lag times between staffing level changes and crime rate changes. Second, the reporting protocols used by the FBI for police employee data and for crime data are very different. Police employee data is a frozen snapshot at one point in time, while crime data is a cumulative total for the entire year. Third, crime trends are marked by frequent short-term fluctuation while police staffing levels change at a much slower pace. Bertrand et al. (2004) recommend against using DID estimations when these assumptions cannot be met.

The other method for measuring this independent variable is to use the staffing level reported in year one for analysis of crime levels reported in year two. This method, described $Y_{(t-1)}$, was justified by Levitt (1997) based on his analysis of the lags between hiring new police officers and those officers' impacts on crime rates. Those lags are related to two factors. First,

[19] DID estimation would be achieved in this dissertation by using the change in officers between years one and two as an independent variable while using the change in crime rates between years one and two.

the FBI police employee and LEOKA reports provide a snapshot of staffing levels in October of the reporting year. So, they are a more accurate depiction of staffing in the upcoming year than in the current year. Second, there is a lag of three to six months before newly hired officers complete training and begin assuming police duties; so, an officer hired in October will not be "on the streets" until the following year. These two concerns are neatly and easily resolved through the $Y_{(t-1)}$ approach. Chalfin and McCrary (2012) confirm this is the appropriate technique to use when assessing the impact of police agency staffing on annual crime rate data, and it has become the measurement most commonly used throughout the recent research on this topic.

Consistent with the analysis of highly-staffed versus minimally-staffed agencies conducted by Guffrey in 2009, I am including no intervening variables in the analysis. Instead, I am following his approach of dealing with the virtually limitless intervening variables through case selection and method construction, as will be more thoroughly discussed in the Limitations sections of this dissertation.

## Dependent Variable

The dependent variable in this research is per capita crime rate change between two consecutive years. This construction of the dependent variable is consistent with the Change Score Regression technique used in this dissertation. Three separate pairs of years were analyzed, effectively replicating this study with each successive analysis. While debate continues in academic circles on the ultimate goal of law enforcement, policy makers and administrators today are quite simply concerned with the bottom-line impact of police agencies

on reducing crime as measured by the Uniform Crime Reports or "UCR". Because I am conducting this research to provide broad policy recommendations to local governments, it is important to concentrate on the variables deemed important by those policy makers and administrators. To put it simply, governments spend money to hire additional police officers because they are seeking to reduce the next year's crime rate. Therefore, this research will focus on year-to-year per capita changes in the UCR crime index as its sole dependent variable.

Corman and Macon (2000) demonstrate considerable differences in the impacts of police agency staffing on the seven crime index offenses. This finding has been confirmed by Levitt (2002) and Chalfin (2012). The UCR divides these seven offenses into two major categories: violent crime and non-violent crime. Given these findings, I will examine each of these two categories as separate dependent variables in addition to examining total overall crime.

To put crime rates into perspective, table 4.2 offers summary descriptive statistics for each year included in this dissertation.

Table 4.2
Summary of Crime Index Statistics

| | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|
| Total Crime<br>per 1,000 residents | 47.78 mean<br>(7.59 - 154.10) | 45.99 mean<br>(5.50 - 148.23) | 47.40 mean<br>(4.65 - 150.24) | 46.70 mean<br>(3.84 - 142.86) |
| Violent Crime<br>per 1,000 residents | 4.94 mean<br>(0.16 - 31.89) | 4.78 mean<br>(0.11 - 27.43) | 4.79 mean<br>(0.15 - 30.49) | 4.68 mean<br>(0.13 - 27.40) |
| Property Crime<br>per 1,000 residents | 42.84 mean<br>(7.42 - 136.59) | 41.21 mean<br>(5.18 - 125.12) | 42.61 mean<br>(3.97 - 128.37) | 42.02 mean<br>(3.51 - 124.64) |

Because the published national crime index summary reports are weighted heavily by cities outside of this dissertation's population parameters, I will not attempt to make comparisons to those reports. However, I did examine the top ten most violent cities (Violent UCR) and the ten cities with the highest crime rates (Total UCR) in the large sample used for this dissertation. I was particularly interested in ensuring all levels of municipal population and all levels of police staffing were represented.

Of the ten cities with the highest per capita crime index ratings, populations ranged from 26,486 to 426,511. Based on this examination, I determined Group I through Group IV were adequately represented in the overall crime index ratings. For each year, between two and three cities from each of the population groups appeared in this top ten listing. These cities did have higher than average police staffing levels, with eight cities exceeding 3.00 officers per 1,000 residents for each year. The average number of officers per 1,000 residents for the ten highest crime cities was 3.35 officers for every 1,000 residents. This was considerably higher than the overall sample average of 1.85 officers.

Of the ten cities with the highest per capita violent crime ratings, populations ranged from 29,453 to 975,020. Group I and Group IV were more strongly represented than Group II and Group III. In each year, only two or three cities total from Groups II and III were included in this top ten group. The remaining cities came equally from Groups I and IV. The police staffing levels for the most violent cities were still higher than the overall sample, averaging 3.13

officers for every 1,000 residents compared to the overall average of 1.85. However, half of the cities in the most violent group were staffed below 3.00 officers per 1,000 residents.

The top ten lists for each year did show an interesting trend for future research. In 1999, eight of the top ten highest crime cities were also included in the top ten most violent crime cities. This percentage lessened for each year. By 2001, only two of the top ten highest crime cities were included the top ten most violent crime list. While the phenomenon is outside of the scope of this dissertation, it is an interesting trend that could potentially form the basis of a future research study.

**Limitations: UCR Data**

There are numerous limitations with the UCR reporting system, particularly with respect to under-reporting of crimes. These limitations are not addressed as part of this study, but may be addressed in future studies by examining the impacts of the independent variables on UCR crimes that are typically under-reported (for example, rape) as opposed to those that are typically reported with high degrees of accuracy (for example, auto theft). Parameters for each crime category's reporting accuracy rate may be obtained from the semi-annual National Criminal Victimization Studies, also available from the National Archive of Criminal Justice Data. However, for purposes of this current research, the reported UCR crime statistics will be used exclusively.

Levitt (1998) examined the impact of reporting bias on studies which relied exclusively on UCR crime statistics. He found a small relationship between police officers and victim reporting, with more police officers leading to slightly higher reporting levels. However, as

Levitt points out, the small bias simply means hiring extra police officers is slightly more attractive than the UCR-only studies depict. As a result of his finding, most modern studies rely on reported crime rates as an accurate measure of crime. The reliance on UCR crime data, as opposed to victimization data, was described by Chalfin and McCrary (2012) as, "the standard measure used in the empirical literature" (p. 22). This dissertation will similarly rely exclusively on UCR crime data as its crime rate measurement tool.

**Limitations: Measuring the Impact of Police Staffing on Crime**

Throughout the Community Policing Era, considerable emphasis was placed on the impact of police agency staffing levels on a community's fear of crime. Innumerable qualitative research studies attempted to capture the value of increased police presence on citizen perception of safety, or fear of crime. The underlying concept was that frightened citizens would be reluctant to occupy public spaces, thus permitting those areas to be "taken over" by criminal elements. Increased police visibility would encourage citizens to partake of public facilities, such as parks and sidewalks, in a manner that would reduce crime opportunities in those spaces. Ultimately, reducing the fear of crime would theoretically lead to reductions in actual crime. Based on that belief, policy makers suggested that police agency performance should be judged through subjective measurements of the public's perception of crime as opposed to the traditional objective measurements of actual crime.

Policy makers and administrators throughout the Community Policing Era repeatedly attempted to use this subjective model to assess law enforcement agency performance. However, as crime rates began to level and ultimately rise at the turn of this century, the policy

makers and administrators returned their focus to objective crime rate statistics as presented in UCR data. For that reason, the impact of police staffing levels on fear of crime is considered outside of the scope of this dissertation. I will examine objective crime statistics to assess agency performance and will not include analysis of community perceptions.

**Limitations: Intervening Variables Impacting Crime**

The most difficult challenge facing researchers with respect to UCR crime data analysis is the fundamental recognition that crime is largely driven by a wide array of socio-economic and demographic inputs. The research on crime causation is vast, with potential intervening variables ranging from abortion rates to zoning trends. Guffrey (2009) suggests the potential intervening variables are almost limitless, making it difficult or impossible to effectively control for their true effects in traditional methods. Alternatively, he suggests that study design and case selection offer the most effective mechanism to account for the infinite array of intervening variables.

The virtually unlimited array of potential intervening variables poses significant risk of a Lord's Paradox (Lord, 1963) if the traditional regressor variable method is employed. Allison (1990), however, proposed that a Change Score regression method offers an effective alternative that is superior in its ability to isolate pre-existing and external conditions.

By using the Change Score method, I am recognizing that the most potent predictor of a city's crime rate is its prior years' crime rates. In essence, cities appear to have a long-term or baseline crime rate that is tied to profound variables, such as population density or economic stratification. Thus, cities with a high crime level in one year are likely to have a similarly high

crime level the following year. Law enforcement serves as a moderating instrument by impacting short-term changes. By measuring the dependent variable using the Change Score method, I am acknowledging and de facto controlling for the baseline crime rate that is tied to each city's unique socio-economic and demographic reality.[20] This research is not designed to address the long-term, underlying causes of crime. Instead, I am specifically addressing short-term, year-to-year changes that would more logically flow from the reactive and preventive nature of the law enforcement role. In this way, I am following Guffrey's lead by framing the research design in a manner that minimizes the impact of pre-existing variables as opposed to attempting to incorporate a woefully incomplete list of potential intervening variables into the regression equation. Not only does this approach eliminate the threat of a Lord's Paradox, it also allows subtle relationships between the dependent and independent variables to surface.

**Limitations: The Urban-Rural Distinction**

There are numerous considerations which must be weighed when examining police agency staffing. Many of these considerations would require in-depth qualitative examination to fully explore. However, some considerations were addressed in this dissertation by specifically narrowing the population of data analyzed to ensure no outliers would skew the results.

Rural police agencies are viewed as distinct by the International Association Chiefs of Police. As with the small agency programs described in the preceding section, the Association provides unique training tracks, technological assistance programs and best practices guides specifically geared toward rural policing. Because of the fundamental differences of rural

[20] For example, if the city of Mayberry had a total crime index of 1000 in 1999 and a total crime index of 1050 in 2000, the dependent variable for the 1999-2000 analysis would be 1050-1000=50.

agencies, there is a potential that inclusion of these agencies in this research would skew the results. Several mechanisms were used to minimize the impact of distinctly rural agencies on the current research. First, by eliminating all cities with populations less than 25,000, I substantially reduce the number of rural areas included in the research population. Second, by only examining staffing levels of identifiable local police agencies (as opposed to sheriff's offices and state police agencies), large swaths of rural territory are excluded. While this is an imperfect mechanism for ensuring only suburban and urban entities are analyzed, it is the most effective tool available for a large sample analysis.

I also recognize that some suburban and urban entities will be excluded from the analysis as a result of this restriction. There is a recent trend, particularly in suburban areas, toward privatization and/or contracting of police services. The most common form appears to be contracting with a county sheriff's office for local police services. Because this type of configuration precludes direct association between a city's crime and its unique, independent police agency, including these alternative agency configurations in the current research would compromise the analysis of data and the ability to make inferences from the results of this analysis. While many of these cities will report UCR crime statistics that are independent from the county-wide data, they do not report local agency law enforcement staffing information. (The FBI collects county level agency and crime data through a separate program.) As a result, they were excluded from the current analysis due to missing data.

## Summary of Data and Limitations

I will examine the time frame from 1999 to 2002, with three pairs of years examined independently. Separate analysis will be conducted of minimally-staffed, moderately-staffed, and highly-staffed agencies. Agencies which do not participate in the UCR program and agencies which did not report employee data will not be included in this analysis.

This dissertation is limited to cities with populations of 25,000 to 999,999, that did not experience greater than 20 percent change in population and/or law enforcement staffing. For this reason, research findings will only be generalizable to cities with relatively stable populations that have not been subject to recent annexation, incorporation, secession, re-districting, or other factors that would create wholesale change in the city's demographic. This research is also limited to cities with an identifiable local police department, and does not include cities which contract with private entities or neighboring jurisdictions for police services.

Consistent with modern convention, UCR crime data will be the exclusive source used to measure crime. Police agency impact on crime will be measured using crime data only and will not be assessed through alternative subjective measures, such as fear of crime.

The study design has been crafted to limit the impact of pre-existing variables on the analysis. Because the list of factors potentially impacting crime is virtually limitless, attempting to conduct a traditional regressor variable analysis with a laundry list of control variables poses a potential Lord's Paradox problem. In order to address this problem, a Change Scores Regression method is used. In this manner, the study design has minimized the impact of pre-existing

variables in lieu of attempting to identify and include all possible variables within the regression equation (Guffrey, 2009).

Finally, this dissertation is intended to examine the relationship between crime and staffing in municipal police agencies, both urban and suburban. While somewhat imperfect, the selection of cities based on population, agency type, and year-to-year stability minimizes the infusion of rural crime patterns into the analysis.

# CHAPTER 5

## SUMMARY OF FINDINGS

As a result of this research, an optimum staffing range of 1.50 to 2.75 officers per 1,000 residents was potentially identified for cities with populations of 25,000 to 999,999. Data was retrieved from the National Archive of Criminal Justice Data (http://www.icpsr.umich.edu/NACJD) for the years 1999, 2000, 2001, and 2002. Data sets used were the F.B.I. Uniform Crime Reporting (UCR) Program Data set and the Police Employees (PE) Tables of the F.B.I.'s annual Crime in the United States reports. Some missing police employee figures were retrieved from the F.B.I.'s Law Enforcement Officers Killed or Assaulted (LEOKA) reports. The data was manually merged to produce three separate data sets: 1999-2000 comparative data, 2000-2001 comparative data, and 2001-2002 comparative data. Over 1,000 cases were included in each year-pair's analysis after eliminations were made in accordance with the preceding chapter's description of selection criteria and data limitations.

Table 5.1
Data Summary

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **Cities Reported** | 1,254 | 1,284 | 1,405 |
| **Eliminated for Missing Data** | 221 | 248 | 316 |
| **Eliminated for Extreme Change** | 24 | 20 | 49 |
| **Percent Eliminated** | 19.53% | 20.87% | 25.97% |
| **Cities Analyzed** | 1,009 | 1,016 | 1,040 |

After completing the cleaning and purging of missing or excluded data, I had a data warehouse of over 3,000 cases with which to pursue the initial Knowledge Discovery in Databases (KD), or data-mining, analysis. Because data mining relies on large data pools rather than small samples, no discussion of sampling is necessary at this point in the discussion.

**Selecting the Staffing Level Range through the KD (Data Mining) Technique**

The first task of the KD process relied heavily on an intuitive determination of ranges to be searched for correlations and trends. Two separate approaches were used. First, I examined measures of central tendency for preliminary guidance. (Table 5.2) Second, I considered the 2.0 to 4.0 officer-to-citizen range identified in the Guffrey (2009) article.

Table 5.2
Descriptive Statistics
Law Enforcement Officers per 1,000 Residents

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **Range** | 0.3276 - 5.4072 | 0.3500 - 5.1427 | 0.3524 - 5.0143 |
| **Mean** | 1.8760 | 1.8462 | 1.8255 |
| **Median** | 1.7397 | 1.7115 | 1.7037 |

Because Guffrey's analysis included cities with more than one million residents, I expected to find a lower range than he did. As discussed in the Chapter 6 of this dissertation, the officer-to-citizen ratios for cities greater than one million were high enough to skew the

overall average for Group I cities. By eliminating those mega cities from this dissertation, I was able to restrict my examination to agencies with similar average staffing levels, ranging from 1.8 to 2.0 officers per 1,000 residents. Also, Guffrey's study purposely included equal representation from all population groups. Although roughly 75 percent of UCR participating agencies fall into the category of populations less than 150,000, Guffrey only dedicates one-third of his sample to cities of this size. Therefore, based on the mean officer-to-citizen ratio shown by this data warehouse, and the potential skew introduced by Guffrey's emphasis on larger cities, I started the KD process from a central point of 2.0 officers per 1,000 residents. Because the research design necessarily included multiple iterations at a variety of potential staffing levels, determining the starting point would not prevent deviation in either direction once correlation patterns began to emerge.

The focus of this KD analysis step was on identifying upper and lower points that would later be used to define the parameters of the moderately-staffed ranges Once the moderately-staffed ranges were defined, minimally and highly staffed ranges would become automatically defined as those levels outside of the moderately-staffed range in either direction.

First, I examined potential upper staffing level points ranging from less than 3.0 to less than 2.0 (Table 5.3). Second, I examined potential lower staffing level points ranging from greater than or equal to 1.0 to greater than or equal to 2.0 (Table 5.4). Correlations between staffing levels and changes in crime rate were analyzed for each level in increments of 0.25. This method could potentially identify as many as twenty-five different staffing level combinations based on the five lower level points and five upper level points.

Points which failed to show a consistent correlation at $p<0.01$ across all three sets of years were eliminated from further consideration. Also, once a consistent correlation of $p<0.01$ emerged for all three pairs of years, all points beyond were eliminated from further consideration in order to focus on those points where significant correlations initially began to appear.

The goal of this KD or data mining step was not to conduct hypothesis testing. Rather, the goal at this point of the analysis was to identify points at which significant relationships and identifiable trends between staffing levels and crime rates began to emerge. The points identified through this data mining process would be used to develop parameters for later hypothesis testing.

Table 5.3
Correlations: Upper Staffing Level

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **< 3.00** | -.120** N=936 | -.092** N=942 | -.158** N=972 |
| **< 2.75** | -.130** N=898 | -.098** N=910 | -.133** N=942 |
| **< 2.50** | -.365** N=841 | -.070* N=865 | -.139** N=899 |
| **< 2.25** | -.097** N=776 | -.008 N=787 | -.059 N=822 |
| **< 2.00** | -.041 N=666 | .048 N=695 | -.021 N=715 |

*p<0.05, **p<0.01

The point at which significant correlations began to consistently appear at the upper staffing level was 2.50 officers per 1,000 residents. The correlations remained significant at all

levels above 2.50; however, this was likely due to the fact that N was beginning to approach the actual population. At 2.25, the correlation was significant for 1999-2000, but not for the other two years. In order to fully and thoroughly examine potential trends and relationships, upper level points of 2.25, 2.50 and 2.75 were subjected to further data mining analysis.

Table 5.4
Correlations: Lower Staffing Level

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **>=2.00** | -.012<br>N=343 | -.008<br>N=321 | -.130*<br>N=325 |
| **>=1.75** | -.073<br>N=496 | -.082<br>N=480 | -.175**<br>N=482 |
| **>=1.50** | -.092*<br>N=685 | -.094*<br>N=676 | -.202**<br>N=679 |
| **>=1.25** | -.105**<br>N=837 | -.104**<br>N=834 | -.196**<br>N=847 |
| **>=1.00** | -.495**<br>N=971 | .086**<br>N=972 | -.191**<br>N=998 |

*p<0.05, **p<0.01

The lower staffing level points identified for further data mining analysis were 1.25, 1.50, and 1.75 officers per 1,000 residents based on the $p<0.01$ significance criteria detailed in the preceding paragraph. Significant correlations began to occur across all three pairs of years at the 1.25 level. However, for 2001-2002, at both the 1.50 and 1.75 levels, a significant correlation between officers and population was apparent. While correlations remained significant at the 1.00 level, this could again be attributed to N approaching the population.

The next step in the data mining process was to search for correlations a second time after the upper and lower points identified in the first iteration were joined to create ranges. With three lower points and three upper points, nine possible staffing level ranges were identified for further trend analysis. These are broken down in Table 5.5.

Table 5.5
Correlations: Staffing Level Ranges

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **1.25 to 2.25** | -.191** N=604 | -.039 N=605 | -.067 N=629 |
| **1.25 to 2.50** | -.272** N=669 | -.107** N=683 | -.161** N=706 |
| **1.25 to 2.75** | -.325** N=726 | -.132** N=728 | -.145** N=749 |
| **1.50 to 2.25** | -.144** N=452 | -.036 N=447 | -.094* N=461 |
| **1.50 to 2.50** | -.237** N=517 | -.115** N=525 | -.194** N=538 |
| **1.50 to 2.75** | -.294** N=574 | -.137** N=570 | -.164** N=581 |
| **1.75 to 2.25** | -.063 N=263 | -.104 N=251 | -.061 N=264 |
| **1.75 to 2.50** | -.186** N=328 | -.166** N=329 | -.187** N=341 |
| **1.75 to 2.75** | -.249** N=385 | -.167** N=374 | -.136** N=384 |

*p<0.05, **p<0.01

Based on the correlations for each range, all ranges with 2.25 officers per capita as the upper boundary were eliminated from further consideration. The ranges which used this particular boundary failed to demonstrate significant correlations with the same degree of consistency as the ranges using higher upper boundaries, even when the number of cases was greater than 600. Correlation coefficients were no stronger than the other ranges examined, so it was clear the upper boundaries of 2.50 and 2.75 offered a more robust basis than 2.25 for further analysis.

The correlation coefficients were quite small. However, this should be expected given the nature of the current research. Because this step of the analysis relied on data warehouse discovery techniques, the emphasis was on indentifying subtle trends. Further discussion of effect size will be included as part of the hypothesis testing section.

Based on the overall KD process, six staffing level ranges were targeted for further testing. Those ranges were: 1.25 to 2.50, 1.25 to 2.75, 1.50 to 2.50, 1.50 to 2.75, 1.75 to 2.50, and 1.75 to 2.75.

## Hypothesis Testing through Regression Analysis

The first step in hypothesis testing is to define the sample. At this point in the analysis, a data warehouse was available with over 1,000 cases for each pair of years being examined. This represented anywhere from 74 percent to 80 percent of the cities which participate in the UCR program. Rather than attempt to select a random or purposive sample from within these cases, I opted to use the full data warehouse for hypothesis testing. This approach has been supported by statisticians under certain circumstances.

Lin, Lucas, and Shmueli (2013) suggest large sample research may be appropriate when the researcher is attempting to detect or quantify a small effect. As demonstrated in the literature review on staffing level research, the relationship between number of police officers and crime is marked by subtle shifts. Lin, et al, also suggest large sample research is ideal when the researcher is interested in analyzing subsamples without diminishing the predictive power of each groups' analysis. The purpose of this dissertation is to analyze the differences between three different groups or subsamples: minimal, moderate, and high staffing levels. While a sample size of 1,000 cases initially appears large, once those cases are divided into the three groups, portions of the analysis will ultimately be conducted on more traditionally-sized samples. Particularly in light of the latter consideration, a large sample size may ultimately prove necessary to properly assess the impacts of each sub-group.

Leamer (1978) offers a lengthy discussion of the benefits and pitfalls of large sample research. He advocates this type of research and suggests it, "can be legitimately used to bring to the surface the nuggets of truth that may be buried in a data set" (Leamer, 1978, p. 2). Specifically, he discusses the use of "metastatistics" in data-selection searches, where separate regression analyses are run on subsets of a large data set to determine which selection criteria offer the most useful results. This dissertation fits neatly within the large sample design suggested by Leamer. Perhaps the biggest concern with a large sample is the potential for an artificially inflated p-value. However, Leamer combats this problem in two ways. First, he recommends using a more rigorous standard than the traditional $p<0.05$ by establishing the appropriate minimum significance level as $p<0.01$. Second, he recommends examining the

results with a prudent eye that is well-versed in the subject matter. Because metastatistics relies on numbers that are very close to the actual population, he suggests that large sample research offers the powerful ability to draw actual inferences from the data as opposed to the idealized inferences drawn during traditional small sample analysis.

Having determined the best sample design is a metastatistics approach using the entire dataset, I next turned to an examination of the linear regression technique. Linear regression is based on four assumptions: a linear relationship exists, the distribution is normal, the residuals are evenly distributed around the prediction line, and the antecedent variables are independent from one another. To ensure these assumptions were met, each of the six ranges was visually examined using a variety of plotting techniques. First, each range was examined using scatter plot and curve estimation to ensure the linearity condition was met. In all cases, reviews of scatter plot and curve estimation results confirmed that a linear model was the best fit for the data. Next, each range was examined using stem and leaf plots to ensure the distribution was normal. All ranges appeared normally distributed, and skewness results were less than 1.0. Finally, each range was examined for homoscedasticity using plots of standardized residuals by standardized predicted values. In each case, the residuals were randomly scattered and evenly distributed around the zero-point line, so the assumption of homoscedacity was met. Because this research design only examined one antecedent, the independence of variables assumption was not a concern in this model. With these four assumptions met, the six selected staffing ranges were considered appropriate for linear regression analysis.

In accordance with guidance offered by Leamer (1978), I determined $p<0.01$ was the appropriate significance level to use for this analysis. While Leamer suggests a level of $p<0.001$ for extremely large samples, he also clarifies that some of the samples he is discussing have in excess of 10,000 cases. Because each of the sub-groups to be analyzed in the dissertation will only be a fraction of the 1,000 case sample, $p<0.01$ appeared to be an appropriate level given the sample size and research design.

Linear regression was conducted on the six staffing level ranges identified in the KD preliminary analysis. None of the ranges with an upper parameter of 2.50 officers per 1,000 citizens showed significant results in the regression analysis across all three pairs of years. For that reason, those ranges (1.25-2.50, 1.50-2.50, and 1.75-2.50) will not be discussed further. Also, none of the ranges with a lower parameter of 1.75 officers per 1,000 citizens showed significant results in the regression analysis across all three pairs of years. Again, those ranges (1.75-2.50 and 1.75-2.75) will not be discussed further.

After reviewing the preliminary regression results, two potential ranges emerged as possible candidates for optimum staffing levels: 1.25 to 2.75 officers per 1,000 citizens and 1.50 to 2.75 officers per 1,000 citizens. The remainder of this analysis will focus only on these two ranges.

The purpose of this study was to determine whether minimally, moderately, and highly staffed law enforcement agencies should expect their respective agency sizes to have impacts of different magnitude on crime rates from one year to the next. In order to accomplish this goal, three groups were identified for each of the three years' data. Groups were labeled "Low,"

"Medium," and "High" for purposes of this examination. The groups falling into the Low category were those which fell below the specified staffing level range, those labeled Medium fell within the staffing level range, and those identified as High were those with staffing levels above the specified range. Each group was tested separately to determine if the null hypothesis could be rejected. **$H_0$: As the number of police officers per capita increases or decreases, the crime rate neither increases nor decreases**.

Table 5.6
Slope Coefficients for 1.25-2.75 Range

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **High** (>=2.75) | -0.252 N=111 | -0.578 N=106 | -2.283 N=98 |
| **Medium** (1.25-2.75) | -1.727** N=726 | -2.090** N=728 | -1.969** N=749 |
| **Low** (<1.25) | -1.026 N=172 | 0.980 N=182 | 1.646 N=193 |

*p<0.05, **p<0.01

For the range 1.25-2.75 officers per capita, the null hypothesis was only rejected for the Medium group at a significance level of $p<0.01$ level for all of the study years. (Table 5.6) The negative slope coefficient suggested an inverse relationship between staffing level and crime index change, which was interpreted to mean that increased numbers of police officers leads to a reduction in the crime index. Coefficients ranged from -1.727 to -2.090, for an average across the years of -1.929. The practical implication of this finding is that an agency can predict a crime index decrease of almost two offenses per capita with the addition of each one officer per capita. However, with approximately 72 percent of all cities falling into this range, there may be

some small concern that the large number of cases is contributing to the significance level of this model. For that reason, the alternate staffing level range, 1.50-2.75, may offer a slightly more reliable finding.

Table 5.7
Slope Coefficients for 1.50-2.75 Range

| | **1999-2000** | **2000-2001** | **2001-2002** |
|---|---|---|---|
| **High** (>=2.75) | -0.252 N=111 | -0.578 N=106 | -2.283 N=98 |
| **Medium** (1.50-2.75) | -2.034** N=574 | -2.610** N=570 | -2.657** N=581 |
| **Low** (<1.50) | -1.026 N=324 | 1.243 N=340 | -0.059 N=361 |

*p<0.05, **p<0.01

For the range 1.50-2.75 officers per capita, we were only able to reject the null hypothesis in the Medium group once again. (Table 5.7) As with the smaller range presented above, the slope coefficient was negative. Therefore, we can once again conclude that an increased number of police officers within these boundaries leads to a greater reduction in the crime index. Coefficients were larger at this staffing level, ranging from -2.034 to -2.657, for an average across the years of -2.434. The practical implication of this finding is that an agency can predict a crime index decrease of almost two and a half offenses per capita with the addition of each one officer per capita. This range consisted of approximately 56 percent of the cities examined, thus reducing concerns that the large sample size might artificially elevate the significance level in this finding.

For both sets of analysis, cities that were staffed at high or low levels did not show any statistical relationship between staffing level and crime index change. In other words, there is no reason to believe adding additional manpower is productive outside of the optimum levels identified in this dissertation. This finding is consistent with Guffrey's assessment. Because we were unable to reject the null hypothesis for either the High or Low groups in any of the pairs of years, it becomes clear we have identified a mid-range group of officer to citizen ratios that provides the greatest potential for impacting year-to-year crime rates. In other words, this research scientifically identifies an optimal staffing range for cities seeking to impact their crime rates.

Because both 1.25-2.75 officers per capita and 1.50-2.75 officers per capita produced significant findings, there is certainly room for debate over which level is best. To further analyze these two identified staffing ranges, I re-examined the hypothesis for the violent crime categories and for the property crime categories.[21] Both Levitt (2002) and Chalfin and McCrary (2012) found a stronger relationship between staffing levels and violent crimes than they did for property crimes. However, Corman and Mocan (2000) found officer impacts on some categories of violent crime, particularly murder and robbery, had lag times as long as three years. The lengthy lag times associated with those violent crime categories would pose no problem for the Levitt and Chalfin and McCrary studies since both were multi-year time series analyses conducted over two decades. However, this dissertation is examining short-term, year to year

[21] Violent Crime includes murder/non-negligent manslaughter, forcible rape, robbery and aggravated assault. Property Crime includes burglary, larceny/theft and motor vehicle theft.

change. That distinction renders the previous guidance on violent and property crime categories inapplicable.

Table 5.8
Slope Coefficients for 1.25-2.75 Range

| | Violent Crime | | | Property Crime | | |
|---|---|---|---|---|---|---|
| | **1999-2000** | **2000-2001** | **2001-2002** | **1999-2000** | **2000-2001** | **2001-2002** |
| **High** (>=2.75) | -0.302 N=111 | -0.007 N=106 | -0.579 N=98 | 0.050 N=111 | -0.572 N=106 | -1.703 N=98 |
| **Medium** (1.25-2.75) | -0.382** N=726 | -0.053 N=728 | -0.158 N=749 | -1.348** N=726 | -2.035** N=728 | -1.811** N=749 |
| **Low** (<1.25) | 0.190 N=172 | -0.353 N=182 | -0.508 N=193 | -0.540 N=172 | 0.404 N=182 | -1.138 N=193 |

*p<0.05, **p<0.01

For the ranges of 1.25 to 2.75 officers per 1,000 residents, a sharp distinction arises between the violent and property crime categories (Table 5.8). Unlike the prior long-term time series studies, our current short-term analysis demonstrates a minimal nexus between officer staffing levels and violent crime. A statistically significant nexus for violent crime categories appears in only one of the three pairs of years and, in each year, the slope coefficients are miniscule. By contrast, the relationship between staffing level and property crimes is statistically significant across all three years. Not only do we achieve significance at $p<0.01$ during all three years, but the slope coefficients also show a much bolder inverse relationship. As with the overall crime figures reported in Table 5.6, staffing level becomes irrelevant above 2.75 officers and below 1.50 officers per 1,000 residents. At those minimally and highly staffed levels, not only does the relationship between staffing and crime fail to achieve significance at

either p<0.05 or p<0.01, but the slope coefficients are extremely small in all but the 2001-2002 Property Crime column.

Table 5.9
Slope Coefficients for 1.50-2.75 Range

| | Violent Crime | | | Property Crime | | |
|---|---|---|---|---|---|---|
| | **1999-2000** | **2000-2001** | **2001-2002** | **1999-2000** | **2000-2001** | **2001-2002** |
| **High** (>=2.75) | -0.302 N=111 | -0.007 N=106 | -0.579 N=98 | 0.050 N=111 | -0.572 N=106 | -1.703 N=98 |
| **Medium** (1.50-2.75) | -0.528** N=574 | -0.001 N=570 | -0.305* N=581 | -1.510* N=574 | -2.609** N=570 | -2.352** N=581 |
| **Low** (<1.50) | 0.098 N=324 | 0.443 N=340 | -0.277 N=361 | -1.124 N=324 | 0.801 N=340 | -0.336 N=361 |

*p<0.05, **p<0.01

Results for 1.50 to 2.75 officers per 1,000 residents were similar. (Table 5.9) For the violent crime categories, a significant nexus at p<0.01 only appears in the earliest pair of years. While the latest pair of years is significant at p<0.05, the size of the impact remains negligible with less than one-third of a violent crime associated with each one officer increase. By contrast, the relationship between officers and property crime is significant at p<0.01 in two of the three pairs of years examined. With respect to the p<0.05 level for the years 1999-2000, it is important to remember that the p<0.01 significance level was chosen due to the large sample size and the close approximation to the overall population. This would certainly hold true at the 1.25-2.75 staffing level, with 72 percent of the cases falling within that particular range. However, the size of the Medium group subsample drops dramatically between 1.25 and 1.50 officers per 1,000 residents. In this smaller range, our Medium subgroup represents only 56 percent of the cases analyzed. For this reason, reliance on the p<0.01 value in accordance with

Leamer's (1978) recommendation for large sample studies may be unnecessary. While the 1999-2000 relationship between staffing level and property crimes may not be statistically significant at our chosen level of $p<0.01$, it is certainly an interesting finding worthy of discussion at its actual value of $p=0.02$. Again, as with the broader range from Table 5.8, the relationship between staffing and property crime was considerably stronger than between staffing and violent crime. As expected, all of the coefficients for the Medium group were negative and were considerably larger than for the High and Low groups.

Based on the analysis of violent and property crime categories, it became clear that the vast bulk of the short-term impact of staffing levels on overall crime could be attributed to the relationship between officer to citizen ratios and property crime. While the broader 1.25 to 2.75 staffing level subgroup appeared somewhat more robust from a statistical significance perspective, the much smaller 1.50 to 2.75 staffing level subgroup maintained that robust significance for two of the three year pairs. Because the large sample concerns which initially prompted reliance on the $p<0.01$ level are mitigated with the smaller subgroup, it may be argued that statistical significance was acceptable across all three pairs of years in the 1.50 to 2.75 staffing level subgroup.

**Selecting the Optimum Range**

As hypothesized, higher police-to-citizen ratios have a negative and linear relationship with crime levels when agencies are staffed at moderate levels. That relationship vanishes when agencies are under-staffed or over-staffed. Two moderate staffing levels were identified through

significance testing: 1.25 to 2.75 officers per 1,000 citizens and 1.50 to 2.75 officers per 1,000 citizens.

While statistical significance is an important figure in any regression analysis, the slope coefficients carried even greater weight for this particular research topic. My goal was to determine which staffing level group offered the largest per officer impact on crime rates. Comparing the coefficients for both the 1.25 to 2.75 group and the 1.50 to 2.75 group, it is quite clear that the narrower range shows a much larger crime reduction associated with each additional officer. Because the impact is more profound, as reflected in the larger slope coefficients, and because the smaller subsample size minimizes potential problems associated with large sample designs, I consider the 1.50 to 2.75 staffing level range to be the optimal staffing level range based on this analysis.

In light of the weak causal relationship between staffing level and violent crime, this optimal staffing level should be considered appropriate for the purpose of addressing property crimes only at this point. As Corman and Mocan (2000) demonstrate, there is a lengthy lag time between increases in police strength and corresponding decreases in violent crimes like murder and robbery. Thus, our current year-to-year research design may not be genuinely suitable for examining the relationship between staffing level ranges and violent crime. An excellent future research opportunity exists to examine whether this staffing level range has a similar impact on violent crime using a long-term design capable of capturing those lagged effects.

## The Implications of R-Squared

The $R^2$ values for all models were extremely low. With values ranging from 0. 13 to 0.27 for the Medium groups, and values hovering at or around 0.00 for the Low and High groups, many researchers would immediately discard the entire model. However, it is important to evaluate the importance of $R^2$ in the context of this particular research project. There is no expectation that police staffing levels are a dominant contributor to changing crime rates. While this study's use of the Change Score method dramatically reduces the impact of pre-existing, intervening variables, it is as impossible to eliminate all external influences as it is to identify everything in a city that contributes to crime. Further influencing the effect of police staffing on changing crime rates is the diverse role police agencies fulfill in the typical community. Whitaker (1982) found that less than thirty percent of a typical police officer's time is dedicated to crime fighting activities. The other sixty percent is spent handling traffic matters, responding to disputes, engaging in administrative activities, rendering medical aid, and responding to a wide range of social service dispatch calls. Using Whitaker's finding, adding three extra police officers to an agency may be more appropriately viewed as adding only one officer to the city's crime fighting effort. So, it should not be surprising that only a small portion of the change in crime rates can be attributed to each additional police officer. The model may only predict one additional police officer yields a crime index reduction of one to three crimes; however, as Whitaker points out, that same officer will also perform a wide range of public service tasks unrelated to crime.

# CHAPTER 6

## DISCUSSION OF STUDY IMPLICATIONS

When crime rates begin to climb, government officials and local citizens predictably react by calling for more police officers on the streets. However, there is considerable disagreement over the effectiveness of responding to crime by simply multiplying the number of officers answering calls and patrolling neighborhoods. With the criminal justice literature demonstrating a wide range of effects associated with increasing and decreasing police department staffing levels, it is difficult for policy makers to make informed choices on police personnel funding issues.

Police personnel represent one of the largest government expenditures, particularly at municipal and county levels. During the height of the Community Era of policing, the federal government subsidized local police salaries and most governments responded by staffing police agencies at unprecedented levels. Prior researchers, however, failed to demonstrate a consistent correlation between police staffing and crime rates. Furthermore, the assumed benefits of routine preventive patrol have largely been discredited by projects like the Kansas City Preventive Patrol Experiment. As the efficacy of manpower-intensive strategies become questionable and the costs become burdensome, agencies are responding to budget cuts by allowing manpower strength to reduce through attrition.

The new millennium has been characterized by rapid advances in communication and technology. As the threat of terrorism became an enormous public concern in 2001, homeland security efforts began to focus on expanding intelligence capabilities as a way to combat terrorist

organizations. This focus on intelligence married well with the advances in communication and technology, and the concept has started to spread throughout the law enforcement community. As the fiscal and administrative popularity of the various manpower-intensive Community Era Policing strategies has begun to wane, the reduced cost and manpower efficiencies touted by the Intelligence-Led Policing strategy are gaining appeal.

Cries for more police officers are rapidly being replaced by cries for more effective police officers. Considering the body of research demonstrating significant non-committed time available to patrol officers, it is not surprising that administrators and budget directors are calling for more efficient use of this costly resource.

As we enter an era of strategic management and intelligent policing, more and more policy makers are asking, "How many officers does an agency need?" Despite all of the research available on police management, there is simply no practical guidance or simple formula available to administrators for determining a basic staffing level. What has been missing from that body of research is an attempt to identify critical staffing margins. This research fills that void and, through repetitive analysis of a large data source, has identified the police agency staffing range which offers the greatest predictive impact on reducing property crime rates from one year to the next. While the identified staffing level did not have an impact on year to year violent crime rates, earlier studies suggest there is a lag time of greater than one year between police staffing changes and impact on violent crime. As a result, future research should determine if this or another optimum staffing level could be identified for long-term impacts on violent crime rates.

One element of this research that is unique from other attempts to identify an optimum police staffing level is the emphasis on distinguishing highly, moderately, and minimally staffed agencies. Without this critical and often overlooked foundation, it is nearly impossible to effectively evaluate the utility of additional manpower expenditures. To put it simply, prior to this dissertation, researchers treated a 10 percent increase in manpower for a grossly understaffed agency exactly the same as a 10 percent increase in manpower for a city with double the national average number of officers per capita. This gap in the literature is filled by this dissertation's clear definition and analysis of minimally staffed, moderately staffed, and heavily staffed levels.

## Explanation of Findings

Two key findings emerged from this dissertation. First, the number of police officers in a moderately staffed agency is more important for reducing crime than the number of police officers in a minimally or highly staffed agency. Second, the number of police officers in a moderately staffed agency is more important for reducing property crime than violent crime. While qualitative research is better suited to explain why those impacts occur, I will offer several possible explanations in order to fuel future research.

### Explanation of Findings: Minimally, moderately and highly staffed agencies comparison

Guffrey (2010) offers the only other research that distinguishes highly staffed agencies from minimally staffed agencies. His findings were largely consistent with the findings of this dissertation and the small differences were likely a result of our respective sample selection criteria. Guffrey, however, offered only a cursory explanation of his conclusions: minimally

staffed agencies are spreading their personnel too thin and highly staffed agencies are inefficient. Drawing parallels to Goldilocks and the Three Bears, the agencies in between are better able to reduce crime because they are staffed "just right." I suggest there are additional explanations for the distinctions found between the various staffing levels.

- Moderately staffed agencies may have achieved a more appropriate balance of personnel resources and non-personnel resources. Because staffing and equipment compete for the same budget dollars, an excess in one category will inevitably lead to a deficiency in the other. Minimally staffed agencies may be relying too heavily on technology, statistics, and equipment while highly staffed agencies may be sacrificing those tools in order to fund more officers on the street.
- Moderately staffed agencies may be large enough to enjoy economies of scale with respect to equipment purchases and employee benefit packages that are not available to the minimally staffed agencies. On the other hand, highly staffed agencies may be hampered by diseconomies of scale, particularly in areas such as fleet maintenance or administrative overhead. At the heart of this suggestion is the realization that each officer must be equipped with a lengthy list of costly gear, including weapons, mobile computers, vehicles, body armor, uniforms, and even software licenses. It is not uncommon for agencies to skimp on critical equipment in order to put more officers on the street, and that creates an inefficient work environment for each officer.
- Minimally staffed agencies may be unable to support a variety of proactive units, such as warrant squads or narcotics units, because they are barely staffed well enough to cover all

necessary patrol shifts. As a result, they may be joining regional task forces that spread resources thinly across a broader jurisdictional area. In that case, a moderately staffed agency that is able to dedicate sufficient personnel and equipment to an in-house unit will be able to control and focus their efforts on specific problems within their singular jurisdiction.

- Highly staffed agencies may host numerous in-house units that are not directly related to crime control. Examples of these units include full-time training academies, forensic laboratories, information systems departments, and communications divisions. These types of units may be more efficiently provided by state, regional, or county agencies to the minimally and moderately staffed agencies.
- Minimally staffed agencies may be required to dedicate a larger portion of their personnel to functions unrelated to UCR crime. Examples of these non-crime activities include traffic intersection control, code enforcement, animal control, and municipal ordinance enforcement. Increasing those agencies' staffing levels may not impact crime rates until the level is adequate to address those non-crime duties with sufficient personnel remaining to perform crime-related tasks more effectively. This is consistent with Guffrey's suggestion that minimally staffed agencies' personnel are spread too thin.

At the heart of these potential explanations is the recognition that some of the difference between minimally, moderately, and highly staffed agencies lies in a host of internal and external agency specifics. The challenge for future research is to disentangle the agency specifics that impact crime rates and the agency specifics that achieve goals unrelated to crime reduction. Thus, the

simple explanation for this dissertation's finding is that moderately staffed agencies are doing something different with their personnel when contrasted with minimally and highly staffed agencies. The challenge in future research will be to identify which of those differences are contributing to the moderately staffed agencies' ability to reduce crime.

**Explanation of Findings: Violent and property crime categories**

Contrary to the findings in prior research[22], I uncovered a stronger relationship between staffing levels and property crimes than I did for staffing levels and violent crimes. After examining the differences between my research design and the earlier studies, I concluded this difference was largely a result of the short-term nature of my design. I was specifically examining year-to-year crime reductions while the other researchers were examining multi-year crime reductions. Corman and Mocan (2000) offer an excellent explanation that fits neatly with my finding. The long-term, time-series design used by Corman and Mocan allowed them to examine lag times between increases to police staffing and reductions in crime rates. The violent crime categories, especially murder and robbery, had longer lag times. In some instances, such as with murder, it took as long as three years before staffing increases led to reductions in those categories of crime. Given their determination that personnel changes took longer to have a tangible impact on violent crimes than property crimes, it is not surprising that my single-year design did not uncover a relationship between staffing levels and violent crime.

A second explanation I offer is that property crimes are more closely linked to Rational Choice Theory than violent crimes. This explanation is consistent with the literature, as well as

[22] See, Levitt (2002), Chalfin and McCrary (2012), and Corman and Mocan (2000).

with the mechanics of the rational choice theory. Cornish and Clarke (1986) largely depend on cost-benefit analysis to build this theory. While, they suggest the benefit may be non-pecuniary in some cases, the bulk of their theoretical framework relies on financial or property gain as the desired outcome in criminal activity. As a result, modern applications typically use Rational Choice Theory to explain property crimes.

Rational Choice Theory offers one of the most expansive explanations for police officers deterring and/or preventing criminal activity. This is a result of the theory's suggestion that deterrence can occur not only during the initial planning stage, but it can also occur at any point during the ongoing planning and actual implementation stages. In other words, Rational Choice Theory is unique in its recognition that a police officer's actions can stop a crime from occurring at any time from the point when the criminal idea first germinated up to the point when the potential offender places his burglary tools on the potential victim's door. Obviously, this framework does not fit as well with crimes of passion. As such, many violent crime categories are better explained by other behavioral theories, such as Anomie, Labeling or Social Learning theory. However, with respect to property crimes, Rational Choice Theory offers expansive opportunities for police intervention. Not only do officers have more time to respond or react, they are also able to employ a wider range of preventive techniques at various points in the potential criminal's decision-making process. This wide window of opportunity for police officers to have an impact on individual crimes would further explain why staffing levels are more closely tied to property crimes than to violent crimes.

## Implications for Policy Makers

I do not attempt to offer staffing level recommendations or evaluation techniques for individual cities. Policy makers must individually evaluate neighborhood, community, and city needs within each agency's unique context. The goal of this research is to provide a general foundation upon which policy makers can build. In other words, the goal is not to provide an inflexible staffing level rule but, rather, to provide a baseline or building block.

There are several ways the identified staffing level range identified by this dissertation can be useful for city administrators.

- Budget authorities may use the staffing level ranges as a base or foundation level that is automatically included in budget requests, with justification only required for personnel requests exceeding the optimum ranges. This could potentially simplify the budget process and may open the door for an outcomes-based budget system to replace the incremental line-item systems in place throughout the country.
- Police administrators may use the distinctions discovered between violent and property crime impacts to develop appropriate responses to crime trends based on the nature of the criminal activity being addressed. Manpower intensive strategies may be more likely to impact property crimes while alternative strategies, such as forensic or technology-based methods, may prove more successful for addressing violent crime patterns.
- Police administrators may use the staffing ranges as a rough guide for the number of personnel needed to adequately conduct core tasks. Most workload assessment methods begin with a zero base, requiring each position to be analyzed independently. By using

the per capita guidelines offered here, police administrators are able to simply build upward from the core, basic police service provisions. For example, traditional functions of patrol, investigation and supervision would be expected to fall within the optimum staffing level ranges identified by this dissertation. Non-traditional functions, such as mounted patrol, special event coverage, or interstate traffic enforcement would be expected to increase agency specific staffing levels but would not be expected to have an impact on crime.

- Police administrators may also use the staffing level ranges to identify positions suitable for conversion from commissioned officers to civilian personnel. This is an area that has been evolving slowly, and many agencies have made significant strides toward civilianizing personnel in communications, crime scene investigation, and juvenile counseling. Once an agency recognizes that police officers in these positions are increasing the officer to citizen staffing ratios without contributing directly to officer impacts on crime rates, the transition to civilianizing personnel becomes more attractive and easier to justify.
- While much of the emphasis has been on increasing the ratio of officers to citizens in order to impact crime rates, police administrators with budget constraints may also use these staffing range recommendations as a tool for examining their deployment strategies. The Kansas City Preventive Patrol Experiment (1974) clearly showed the tremendous resource of non-committed patrol officer time available to an agency. Corman and Mocan (2000) showed how increasing officers led to increased arrest rates, which then

led to decreased violent crime rates over two or three years. For an agency without the resources needed to increase staffing, using non-committed time to mimic the crime fighting activities additional officers would be expected to provide, such as higher numbers of arrests, may allow agencies to achieve the impacts of additional police officers through efficiency mechanisms rather than costly new hires.

More than anything, this dissertation helps police administrators, government leaders, and taxpayers understand the impacts they might realistically expect from hiring additional officers. The most common push for more cops happens when cities experience a surge in violent crime. Often those cities already have very high staffing levels. Government leaders and police administrators, particularly during election cycles, are quick to appease the public with media releases about putting more officers on the streets. The public then expects to see instant, large-scale reductions in shootings and armed robberies. Needless to say, they are often disappointed. As this dissertation shows, increasing manpower in a highly staffed agency is likely to yield no results on crime. Increasing manpower in a moderately staffed agency is likely to yield a small reduction in property crimes, but no attendant decrease in violent crime. By understanding the narrow, short-term results an increase in staffing levels may potentially yield, policy makers are better able to devise more holistic strategies that are less likely to disappoint their constituents.

## Implications for Future Research

While the primary focus of this dissertation is on practical staffing level guidance, there are tremendous opportunities for future research based on these findings. KD and metadata

techniques are frequently used to identify avenues for subsequent micro-level and qualitative research, and this dissertation has identified several prime areas for future research.

Of particular interest for follow-up research is a qualitative review of the structural differences between the minimally, moderately, and highly staffed agencies. Guffrey (2010) suggests minimally staffed agencies may be spreading their personnel too thin to be effective; but, he offers no research-based support for his explanation. Are there other explanations? Do smaller agencies rely on other resources, such as state or county law enforcement, to perform crime fighting tasks like narcotics enforcement or cold case investigations? Do smaller agencies dedicate a larger portion of their personnel resources to functions unrelated to UCR crime, such as traffic intersection controls or municipal ordinance enforcement?

At the other end of the spectrum, Guffrey suggests that highly staffed agencies may be operating inefficiently. Again, he offers no research-based support for that explanatory assumption, and alternative explanations are likely. Are there functions in those highly staffed agencies that are routinely contracted to other entities by moderately staffed agencies? For example, a highly staffed agency might be dedicating resources to an in-house police academy, crime lab, technology section, or communications division while the moderately staffed agency may rely on the state or county for those services. Understanding these differences will help clarify the impact of core or foundation staffing levels on crime rates.

Another avenue for future research is examination of the long-term impacts of staffing level ranges on crime rates. This dissertation examined year-to-year, short-term change. While this is the most relevant time frame encountered during typical election cycle reviews of

staffing levels, it only yielded a statistically significant result for property crime. Consistent with Corman and Mocan's study in 2000, most categories of violent crime have longer lag times than the twelve month period examined in this dissertation. While staffing level did not appear to be associated with violent crime in this short-term analysis, the earlier research hints at the possibility of an association when examined over a longer term.

Finally, when reviewing the top ten crime cities in this study, I encountered an interesting phenomenon. In 1999, eighty percent of the top ten overall crime cities were also included in the top ten violent crime cities. Each year, that percentage dwindled until, in 2002, only twenty percent of the top ten overall crime cities were also included in the top ten violent crime cities. While this finding only qualifies as an interesting tidbit at this point, more in-depth analysis of the cities involved may yield findings of social and scientific importance.

Finally, this research is intended to narrowly respond to an ongoing policing paradigm shift, and is neither critique nor commentary on the staffing levels of earlier policing paradigms. The Community Policing Era boasted exceptionally large numbers of police officers on most city streets. I have not attempted to evaluate whether crime rate decreases during that era were associated with those increases in police manpower or with other factors, like technological advances or enhanced social service provision. The current research is narrowly limited in its examination of staffing levels and crime rates during the current shift toward a more efficiency-oriented paradigm, commonly referred to as the Intelligence-Led Era or Strategic Management Era. However, a comparative historical analysis of staffing level effectiveness during the height

of the various policing eras identified in the literature would offer tremendous insight for future staffing decisions.

**Summary**

Despite its narrow focus and inherent limitations, this dissertation represents a critical first step to better understanding the impacts of minimal, moderate, and high police staffing levels on short-term property crime rates. This dissertation fills a void in extant literature and research, and offers a valuable contribution designed to improve the accuracy of ongoing research and policy evaluation in the field of urban police administration. The staffing levels examined in this dissertation should not be viewed as inflexible staffing rules. Instead, the optimum staffing level identified here is intended only to offer a simple and practical foundation upon which informed staffing decisions can be built.

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## APPENDIX A

### List of Cities

Cities designated with "1" were used in the 1999-2000 comparative analysis. Cities designated with "2" were used in the 2000-2001 comparative analysis. Cities designated with "3" were used in the 2001-2002 comparative analysis.

| | | |
|---|---|---|
| Aniston | Alabama | 2 |
| Auburn | Alabama | 3 |
| Birmingham | Alabama | 1,2,3 |
| Dothan | Alabama | 1,2,3 |
| Florence | Alabama | 1,2,3 |
| Homewood | Alabama | 3 |
| Huntsville | Alabama | 1,2,3 |
| Madison | Alabama | 2,3 |
| Mobile | Alabama | 1,2,3 |
| Montgomery | Alabama | 1,2,3 |
| Phenix City | Alabama | 1,2,3 |
| Prichard | Alabama | 3 |
| Tuscaloosa | Alabama | 1,2,3 |
| Anchorage | Alaska | 1,2,3 |
| Fairbanks | Alaska | 1,2,3 |
| Apache Junction | Arizona | 2,3 |
| Avondale | Arizona | 1 |
| Bullhead City | Arizona | 1,2 |
| Casa Grande | Arizona | 2,3 |
| Chandler | Arizona | 1 |
| Flagstaff | Arizona | 1,2,3 |
| Gilbert | Arizona | 1,2,3 |
| Glendale | Arizona | 1,2,3 |
| Lake Havasu City | Arizona | 1,2,3 |
| Mesa | Arizona | 1,2 |
| Oro Valley | Arizona | 2,3 |
| Peoria | Arizona | 1,2 |
| Prescott | Arizona | 1 |
| Prescott Valley | Arizona | 1 |
| Scottsdale | Arizona | 1,2,3 |
| Sierra Vista | Arizona | 1,2,3 |
| Tempe | Arizona | 1,2,3 |
| Tucson | Arizona | 1,2,3 |
| Conway | Arkansas | 1,2,3 |
| Fayetteville | Arkansas | 1,2,3 |
| Fort Smith | Arkansas | 1,2,3 |
| Hot Springs | Arkansas | 1 |

| | | |
|---|---|---|
| Jacksonville | Arkansas | 1 |
| Jonesboro | Arkansas | 1 |
| Little Rock | Arkansas | 1,2,3 |
| North Little Rock | Arkansas | 1,2,3 |
| Pine Bluff | Arkansas | 1 |
| Rogers | Arkansas | 1,2 |
| Russellville | Arkansas | 1 |
| Springdale | Arkansas | 1,2,3 |
| Texarkana | Arkansas | 3 |
| West Memphis | Arkansas | 1,2 |
| Alameda | California | 1,2,3 |
| Alhambra | California | 1,2,3 |
| Anaheim | California | 1,2,3 |
| Antioch | California | 1,2,3 |
| Arcadia | California | 1,2,3 |
| Atascadero | California | 1,2,3 |
| Atwater | California | 1 |
| Azusa | California | 1,2,3 |
| Bakersfield | California | 1,2,3 |
| Baldwin Park | California | 1,2,3 |
| Banning | California | 1,2 |
| Bell | California | 1,2,3 |
| Bell Gardens | California | 1,2,3 |
| Belmont | California | 1,2,3 |
| Benicia | California | 1,2,3 |
| Berkeley | California | 1,2,3 |
| Beverly Hills | California | 1,2,3 |
| Brea | California | 1,2,3 |
| Buena Park | California | 1,2,3 |
| Burbank | California | 1,2,3 |
| Burlingame | California | 1,2,3 |
| Calexico | California | 1,2 |
| Campbell | California | 1,2,3 |
| Carlsbad | California | 1,2,3 |
| Cathedral City | California | 1,2,3 |
| Ceres | California | 1,2,3 |
| Chico | California | 1,2,3 |
| Chino | California | 1,2,3 |
| Chula Vista | California | 1,2,3 |
| Claremont | California | 1,2,3 |
| Clovis | California | 1,2,3 |
| Colton | California | 1,2,3 |
| Concord | California | 1,2,3 |
| Corona | California | 1,2,3 |
| Coronado | California | 1,2 |

| | | |
|---|---|---|
| Costa Mesa | California | 1,2,3 |
| Covina | California | 1,2,3 |
| Culver City | California | 1,2,3 |
| Cypress | California | 1,2,3 |
| Daly City | California | 1,2,3 |
| Davis | California | 1,2,3 |
| Delano | California | 1 |
| Downey | California | 1,2,3 |
| Dublin | California | 3 |
| East Palo Alto | California | 1,2 |
| El Cajon | California | 1,2,3 |
| El Centro | California | 1,2,3 |
| El Monte | California | 1,2,3 |
| Escondido | California | 1,2,3 |
| Eureka | California | 1,2,3 |
| Fairfield | California | 1,2,3 |
| Folsom | California | 1,2,3 |
| Fontana | California | 1,2,3 |
| Foster City | California | 1,2,3 |
| Fountain Valley | California | 1,2,3 |
| Fremont | California | 1,2,3 |
| Fresno | California | 1,2,3 |
| Fullerton | California | 1,2,3 |
| Garden Grove | California | 1,2,3 |
| Gardena | California | 3 |
| Gilroy | California | 1,2,3 |
| Glendale | California | 1,3 |
| Glendora | California | 1,2,3 |
| Hanford | California | 1,2,3 |
| Hawthorne | California | 1,2,3 |
| Hayward | California | 1,3 |
| Helmet | California | 3 |
| Hollister | California | 1,2,3 |
| Huntington Beach | California | 1,2,3 |
| Huntington Park | California | 1,2,3 |
| Imperial Beach | California | 3 |
| Indio | California | 1,2,3 |
| Irvine | California | 1,2,3 |
| La Habra | California | 1,2,3 |
| La Mesa | California | 1,2,3 |
| La Verne | California | 1,2,3 |
| Laguna Beach | California | 1,2 |
| Livermore | California | 1,2,3 |
| Lodi | California | 1,2,3 |
| Lompoc | California | 1,2,3 |

| | | |
|---|---|---|
| Long Beach | California | 1,2,3 |
| Los Altos | California | 1,3 |
| Los Banos | California | 3 |
| Los Gatos | California | 1,2,3 |
| Madera | California | 1,2,3 |
| Manhattan Beach | California | 3 |
| Manteca | California | 1,2,3 |
| Marina | California | 3 |
| Martinez | California | 3 |
| Maywood | California | 1,2,3 |
| Menlo Park | California | 1,2,3 |
| Merced | California | 1,2,3 |
| Milpitas | California | 1,2,3 |
| Modesto | California | 1,2 |
| Monrovia | California | 1,2 |
| Montclair | California | 1,2,3 |
| Montebello | California | 1,2,3 |
| Monterey | California | 1,2,3 |
| Monterey Park | California | 1,2,3 |
| Morgan Hill | California | 3 |
| Mountain View | California | 1,2,3 |
| Murrieta | California | 2 |
| Napa | California | 1,2,3 |
| National City | California | 1,2,3 |
| Newark | California | 1,2,3 |
| Newport Beach | California | 1,2,3 |
| Novato | California | 1,2,3 |
| Oakland | California | 1,2,3 |
| Oceanside | California | 3 |
| Ontario | California | 1,2,3 |
| Orange | California | 1,2,3 |
| Oxnard | California | 1,2,3 |
| Pacifica | California | 1,2,3 |
| Palm Springs | California | 1,2,3 |
| Palo Alto | California | 1,2,3 |
| Paradise | California | 1,2,3 |
| Pasadena | California | 1,2,3 |
| Paso Robles | California | 3 |
| Petaluma | California | 1,2,3 |
| Pittsburg | California | 1,2,3 |
| Placentia | California | 1,2,3 |
| Pleasant Hill | California | 1,2,3 |
| Pleasanton | California | 1,2,3 |
| Pomona | California | 1,2,3 |
| Porterville | California | 1,2,3 |

| | | |
|---|---|---|
| Redding | California | 1,2,3 |
| Redlands | California | 1,2,3 |
| Redondo Beach | California | 1,2,3 |
| Redwood City | California | 1,2,3 |
| Rialto | California | 1,2,3 |
| Richmond | California | 1,2,3 |
| Ridgecrest | California | 1,2,3 |
| Riverside | California | 1,2,3 |
| Rocklin | California | 1,3 |
| Rohnert Park | California | 1,2,3 |
| Roseville | California | 1,2,3 |
| Sacramento | California | 1,2,3 |
| Salinas | California | 3 |
| San Bernardino | California | 1,2,3 |
| San Bruno | California | 1,2,3 |
| San Carlos | California | 1,2,3 |
| San Francisco | California | 1 |
| San Gabriel | California | 1,2,3 |
| San Jacinto | California | 1,2 |
| San Jose | California | 1,2,3 |
| San Leandro | California | 1,2,3 |
| San Luis Obispo | California | 1,2,3 |
| San Mateo | California | 1,2,3 |
| San Pablo | California | 1,2,3 |
| San Rafael | California | 1,2,3 |
| Santa Ana | California | 1,2,3 |
| Santa Barbara | California | 1,2,3 |
| Santa Clara | California | 1,2,3 |
| Santa Cruz | California | 2,3 |
| Santa Maria | California | 1,2 |
| Santa Monica | California | 1,2,3 |
| Santa Paula | California | 1,2,3 |
| Santa Rosa | California | 1,2,3 |
| Seal Beach | California | 1,2,3 |
| Seaside | California | 1,2,3 |
| Simi Valley | California | 2,3 |
| South Gate | California | 1,2,3 |
| South Pasadena | California | 3 |
| South San Francisco | California | 2,3 |
| Stockton | California | 1,2,3 |
| Suisun City | California | 1,2,3 |
| Sunnyvale | California | 1,2,3 |
| Torrance | California | 1,2,3 |
| Tracy | California | 1,2,3 |
| Tulare | California | 1,2,3 |

| | | |
|---|---|---|
| Turlock | California | 1,2,3 |
| Tustin | California | 1,2,3 |
| Union City | California | 1,2,3 |
| Upland | California | 1,2,3 |
| Vacaville | California | 1,2,3 |
| Vallejo | California | 1,2,3 |
| Ventura | California | 1,2,3 |
| Visalia | California | 1,2,3 |
| Walnut Creek | California | 1,2,3 |
| Watsonville | California | 1,2,3 |
| West Covina | California | 1,2,3 |
| West Sacramento | California | 2,3 |
| Westminster | California | 3 |
| Whittier | California | 1,2,3 |
| Woodland | California | 1,2,3 |
| Yuba City | California | 1,2,3 |
| Arvada | Colorado | 3 |
| Aurora | Colorado | 1,2,3 |
| Boulder | Colorado | 1,2,3 |
| Broomfield | Colorado | 1,2 |
| Colorado Springs | Colorado | 1,2,3 |
| Denver | Colorado | 1,2,3 |
| Englewood | Colorado | 3 |
| Fort Collins | Colorado | 1,2,3 |
| Grand Junction | Colorado | 1,2,3 |
| Greeley | Colorado | 1,2,3 |
| Lakewood | Colorado | 1,2,3 |
| Littleton | Colorado | 3 |
| Loveland | Colorado | 2,3 |
| Northglenn | Colorado | 1,2,3 |
| Pueblo | Colorado | 1,2,3 |
| Thornton | Colorado | 1,2,3 |
| Wheat Ridge | Colorado | 2,3 |
| Branford | Connecticut | 1,2,3 |
| Bridgeport | Connecticut | 1,2,3 |
| Bristol | Connecticut | 1,2,3 |
| Cheshire | Connecticut | 1,2 |
| Danbury | Connecticut | 1,2,3 |
| East Hartford | Connecticut | 1,2 |
| East Haven | Connecticut | 2,3 |
| Enfield | Connecticut | 1,2,3 |
| Fairfield | Connecticut | 1,2,3 |
| Glastonbury | Connecticut | 1,2,3 |
| Greenwich | Connecticut | 1,2,3 |
| Groton Town | Connecticut | 1,2,3 |

| | | |
|---|---|---|
| Hamden | Connecticut | 1 |
| Hartford | Connecticut | 1,2,3 |
| Manchester | Connecticut | 1,2 |
| Meriden | Connecticut | 1,2,3 |
| Middletown | Connecticut | 1,2,3 |
| Milford | Connecticut | 1,2,3 |
| Naugatuck | Connecticut | 1,2,3 |
| New Britain | Connecticut | 1,2,3 |
| New Haven | Connecticut | 1,2 |
| New London | Connecticut | 2 |
| New Milford | Connecticut | 1,2,3 |
| Newington | Connecticut | 1 |
| Newtown | Connecticut | 2,3 |
| Norwich | Connecticut | 1,2,3 |
| Shelton | Connecticut | 1,2,3 |
| Southington | Connecticut | 1,2,3 |
| Stamford | Connecticut | 1,2,3 |
| Stratford | Connecticut | 1,2,3 |
| Torrington | Connecticut | 1,2,3 |
| Trumbull | Connecticut | 1,2 |
| Vernon | Connecticut | 1,2,3 |
| West Hartford | Connecticut | 1,2,3 |
| West Haven | Connecticut | 1,2 |
| Westport | Connecticut | 1,2 |
| Wethersfield | Connecticut | 1,2,3 |
| Windsor | Connecticut | 1,2,3 |
| Dover | Delaware | 1,2,3 |
| Newark | Delaware | 1,2,3 |
| Wilmington | Delaware | 1,2 |
| Altamonte Springs | Florida | 1,2,3 |
| Apopka | Florida | 3 |
| Aventura | Florida | 3 |
| Boca Raton | Florida | 1,2,3 |
| Boynton Beach | Florida | 1,2,3 |
| Bradenton | Florida | 1,2 |
| Cape Coral | Florida | 1,2,3 |
| Casselberry | Florida | 1 |
| Clearwater | Florida | 1,2,3 |
| Coconut Creek | Florida | 1,2,3 |
| Cooper City | Florida | 1,2,3 |
| Coral Gables | Florida | 1,2,3 |
| Coral Springs | Florida | 1,2,3 |
| Davie | Florida | 1,2,3 |
| Daytona Beach | Florida | 1,2,3 |
| Deerfield Beach | Florida | 2,3 |

| | | |
|---|---|---|
| Delray Beach | Florida | 1,2,3 |
| Fort Lauderdale | Florida | 1,2,3 |
| Fort Myers | Florida | 1,2,3 |
| Fort Pierce | Florida | 1,2,3 |
| Gainesville | Florida | 1,2,3 |
| Greenacres City | Florida | 1,2 |
| Hallandale | Florida | 1,2,3 |
| Hialeah | Florida | 1,2,3 |
| Hollywood | Florida | 1,2,3 |
| Homestead | Florida | 1,2,3 |
| Jacksonville | Florida | 1,2,3 |
| Jupiter | Florida | 1,2,3 |
| Key West | Florida | 2,3 |
| Kissimmee | Florida | 1,2,3 |
| Lake Worth | Florida | 1,2,3 |
| Lakeland | Florida | 1,2,3 |
| Largo | Florida | 1,2,3 |
| Margate | Florida | 1,2,3 |
| Melbourne | Florida | 3 |
| Miami | Florida | 1,2,3 |
| Miami Beach | Florida | 1,2,3 |
| Miramar | Florida | 1,2,3 |
| North Lauderdale | Florida | 1 |
| North Miami | Florida | 1,2,3 |
| North Miami Beach | Florida | 1,2,3 |
| Ocala | Florida | 3 |
| Ocoee | Florida | 3 |
| Orlando | Florida | 1,2,3 |
| Ormond Beach | Florida | 1,2,3 |
| Oviedo | Florida | 2,3 |
| Palm Bay | Florida | 1,2,3 |
| Palm Beach Gardens | Florida | 1,2,3 |
| Panama City | Florida | 1,2,3 |
| Pembroke Pines | Florida | 1,2 |
| Pensacola | Florida | 3 |
| Pinellas Park | Florida | 1,2,3 |
| Plant City | Florida | 1,2,3 |
| Plantation | Florida | 1,2,3 |
| Port Orange | Florida | 1,2,3 |
| Port St. Lucie | Florida | 1,2,3 |
| Riviera Beach | Florida | 3 |
| Sanford | Florida | 2,3 |
| Sarasota | Florida | 1,2,3 |
| St. Petersburg | Florida | 1,2,3 |
| Sunrise | Florida | 1,2,3 |

| | | |
|---|---|---|
| Tallahassee | Florida | 1,2,3 |
| Tamarac | Florida | 3 |
| Tampa | Florida | 1,2,3 |
| Titusville | Florida | 1,2,3 |
| West Palm Beach | Florida | 1,2,3 |
| Winter Haven | Florida | 1,2,3 |
| Winter Park | Florida | 2,3 |
| Winter Springs | Florida | 1,2,3 |
| Albany | Georgia | 1,2,3 |
| Alpharetta | Georgia | 1,2,3 |
| Athens | Georgia | 3 |
| Atlanta | Georgia | 1,2,3 |
| Columbus | Georgia | 1,2,3 |
| Dalton | Georgia | 2,3 |
| Hinesville | Georgia | 1,2,3 |
| La Grange | Georgia | 1,2,3 |
| Macon | Georgia | 1,2,3 |
| Marietta | Georgia | 1,2,3 |
| Peachtree City | Georgia | 1,2 |
| Rome | Georgia | 1,2,3 |
| Savannah | Georgia | 1,2,3 |
| Smyrna | Georgia | 1,2,3 |
| Valdosta | Georgia | 3 |
| Warner Robins | Georgia | 2,3 |
| Honolulu | Hawaii | 1,2,3 |
| Boise | Idaho | 1,2,3 |
| Caldwell | Idaho | 2,3 |
| Coeur d'Alene | Idaho | 1,2,3 |
| Idaho Falls | Idaho | 1,2,3 |
| Lewiston | Idaho | 1,2,3 |
| Meridian | Idaho | 1,2,3 |
| Nampa | Idaho | 1,2,3 |
| Pocatello | Idaho | 1,2,3 |
| Twin Falls | Idaho | 1,2,3 |
| Aurora | Illinois | 1 |
| Naperville | Illinois | 1 |
| Peoria | Illinois | 1 |
| Rockford | Illinois | 1 |
| Springfield | Illinois | 1 |
| Bloomington | Indiana | 1 |
| Carmel | Indiana | 1,2,3 |
| Columbus | Indiana | 1,2,3 |
| East Chicago | Indiana | 3 |
| Elkhart | Indiana | 1,2,3 |
| Evansville | Indiana | 1,2,3 |

| | | |
|---|---|---|
| Fishers | Indiana | 1 |
| Fort Wayne | Indiana | 1,2,3 |
| Gary | Indiana | 1,2,3 |
| Goshen | Indiana | 1,2,3 |
| Greenwood | Indiana | 1,2,3 |
| Hammond | Indiana | 1 |
| Indianapolis | Indiana | 1,2 |
| Jeffersonville | Indiana | 2,3 |
| Kokomo | Indiana | 1,2,3 |
| Lafayette | Indiana | 2 |
| Lawrence | Indiana | 1,2,3 |
| Marion | Indiana | 3 |
| Merrillville | Indiana | 1,2,3 |
| Michigan City | Indiana | 1,2,3 |
| Mishawaka | Indiana | 1,2,3 |
| Munci | Indiana | 3 |
| New Albany | Indiana | 1,2,3 |
| Noblesville | Indiana | 1,2,3 |
| Portage | Indiana | 1,2,3 |
| Richmond | Indiana | 1 |
| South Bend | Indiana | 1,2,3 |
| Valparaiso | Indiana | 1,2,3 |
| West Lafayette | Indiana | 2,3 |
| Ames | Iowa | 3 |
| Ankeny | Iowa | 1,2,3 |
| Bettendorf | Iowa | 1,2,3 |
| Burlington | Iowa | 1,2,3 |
| Cedar Falls | Iowa | 1,2,3 |
| Cedar Rapids | Iowa | 1,2,3 |
| Council Bluffs | Iowa | 1,2,3 |
| Davenport | Iowa | 1,2,3 |
| Des Moines | Iowa | 1,2,3 |
| Dubuque | Iowa | 1 |
| Fort Dodge | Iowa | 1,2,3 |
| Iowa City | Iowa | 1,2,3 |
| Marion | Iowa | 3 |
| Marshalltown | Iowa | 1,2,3 |
| Mason City | Iowa | 1,2,3 |
| Ottumwa | Iowa | 3 |
| Sioux City | Iowa | 1,2,3 |
| Urbandale | Iowa | 1 |
| Waterloo | Iowa | 1,2,3 |
| West Des Moines | Iowa | 1,2,3 |
| Wichita | Kansas | 1,2,3 |
| Bowling Green | Kentucky | 1,2,3 |

| | | |
|---|---|---|
| Lexington | Kentucky | 1,3 |
| Louisville | Kentucky | 1,2,3 |
| Owensboro | Kentucky | 1,2,3 |
| Paducah | Kentucky | 1,2,3 |
| Richmond | Kentucky | 3 |
| Alexandria | Louisiana | 1,3 |
| Bossier City | Louisiana | 1,2,3 |
| Houma | Louisiana | 1,2,3 |
| Kenner | Louisiana | 1,2 |
| Lafayette | Louisiana | 1,2,3 |
| Lake Charles | Louisiana | 1,2,3 |
| Monroe | Louisiana | 1,2 |
| New Iberia | Louisiana | 1,3 |
| New Orleans | Louisiana | 1,2,3 |
| Shreveport | Louisiana | 1,2,3 |
| Slidell | Louisiana | 1,2,3 |
| Bangor | Maine | 2,3 |
| Lewiston | Maine | 2,3 |
| Portland | Maine | 2,3 |
| Annapolis | Maryland | 1,2,3 |
| Baltimore | Maryland | 2,3 |
| Frederick | Maryland | 1,2,3 |
| Hagerstown | Maryland | 1,2,3 |
| Agawam | Massachusetts | 1,2,3 |
| Amherst | Massachusetts | 1,2,3 |
| Andover | Massachusetts | 1,2,3 |
| Arlington | Massachusetts | 1 |
| Attleboro | Massachusetts | 1,2,3 |
| Barnstable | Massachusetts | 1,2,3 |
| Beverly | Massachusetts | 3 |
| Boston | Massachusetts | 1,2,3 |
| Braintree | Massachusetts | 3 |
| Bridgewater | Massachusetts | 1,2 |
| Brockton | Massachusetts | 1,2,3 |
| Brookline | Massachusetts | 2,3 |
| Cambridge | Massachusetts | 1,2 |
| Chelmsford | Massachusetts | 3 |
| Chelsea | Massachusetts | 1 |
| Chicopee | Massachusetts | 1,2,3 |
| Danvers | Massachusetts | 1,3 |
| Dartmouth | Massachusetts | 1,2,3 |
| Dracut | Massachusetts | 1,2,3 |
| Everett | Massachusetts | 1,2,3 |
| Fall River | Massachusetts | 1,2,3 |
| Falmouth | Massachusetts | 1,2,3 |

| | | |
|---|---|---|
| Fitchburg | Massachusetts | 1,2,3 |
| Franklin | Massachusetts | 2,3 |
| Gloucester | Massachusetts | 1,2,3 |
| Haverhill | Massachusetts | 2,3 |
| Holyoke | Massachusetts | 1,2,3 |
| Lawrence | Massachusetts | 1,2,3 |
| Leominster | Massachusetts | 1,2,3 |
| Lexington | Massachusetts | 1 |
| Lowell | Massachusetts | 1,2,3 |
| Lynn | Massachusetts | 1 |
| Marlborough | Massachusetts | 1,2,3 |
| Medford | Massachusetts | 1,2,3 |
| Melrose | Massachusetts | 1,2,3 |
| Methuen | Massachusetts | 1,2,3 |
| Milford | Massachusetts | 1 |
| Milton | Massachusetts | 1,2 |
| Natick | Massachusetts | 1,2,3 |
| Needham | Massachusetts | 1,2,3 |
| New Bedford | Massachusetts | 2 |
| Newton | Massachusetts | 1,2 |
| North Andover | Massachusetts | 1,3 |
| North Attleboro | Massachusetts | 3 |
| Northampton | Massachusetts | 1,2 |
| Norwood | Massachusetts | 1,2 |
| Peabody | Massachusetts | 1,2,3 |
| Pittsfield | Massachusetts | 1,2 |
| Plymouth | Massachusetts | 1,2,3 |
| Quincy | Massachusetts | 1,2,3 |
| Randolph | Massachusetts | 1,2,3 |
| Revere | Massachusetts | 1,2,3 |
| Salem | Massachusetts | 1,2,3 |
| Saugus | Massachusetts | 1 |
| Shrewsbury | Massachusetts | 1,2 |
| Somerville | Massachusetts | 1,2,3 |
| Springfield | Massachusetts | 1,2,3 |
| Taunton | Massachusetts | 1,2,3 |
| Tewksbury | Massachusetts | 1,2 |
| Wakefield | Massachusetts | 1 |
| Waltham | Massachusetts | 1,2,3 |
| Watertown | Massachusetts | 1 |
| Wellesley | Massachusetts | 1,2,3 |
| West Springfield | Massachusetts | 3 |
| Westfield | Massachusetts | 1,2 |
| Weymouth | Massachusetts | 1 |
| Woburn | Massachusetts | 1,2,3 |

| | | |
|---|---|---|
| Worcester | Massachusetts | 1,2 |
| Allen Park | Michigan | 1,2,3 |
| Ann Arbor | Michigan | 1,2,3 |
| Battle Creek | Michigan | 2,3 |
| Bay City | Michigan | 1,2 |
| Bloomfield Township | Michigan | 1,2,3 |
| Burton | Michigan | 1,2,3 |
| Canton Township | Michigan | 1,2,3 |
| Chesterfield Township | Michigan | 1,2,3 |
| Clinton Township | Michigan | 1,2 |
| Dearborn | Michigan | 1,2,3 |
| Dearborn Heights | Michigan | 1,2 |
| Detroit | Michigan | 1,2,3 |
| East Lansing | Michigan | 2,3 |
| Eastpointe | Michigan | 1,2,3 |
| Farmington Hills | Michigan | 1,2,3 |
| Flint | Michigan | 1 |
| Flint Township | Michigan | 1,2,3 |
| Garden City | Michigan | 1,2,3 |
| Grand Blanc Township | Michigan | 1,2,3 |
| Grand Rapids | Michigan | 2 |
| Holland | Michigan | 1,2,3 |
| Inkster | Michigan | 1,3 |
| Jackson | Michigan | 1,2,3 |
| Kalamazoo | Michigan | 1,2,3 |
| Kentwood | Michigan | 1,2,3 |
| Lansing | Michigan | 1,2,3 |
| Lincoln Park | Michigan | 1,2,3 |
| Livonia | Michigan | 1,2,3 |
| Madison Heights | Michigan | 1,2,3 |
| Meridian Township | Michigan | 1,2,3 |
| Midland | Michigan | 1,2,3 |
| Mount Pleasant | Michigan | 3 |
| Muskegon | Michigan | 1,2,3 |
| Novi | Michigan | 1,2,3 |
| Pittsfield Township | Michigan | 1,2,3 |
| Plymouth Township | Michigan | 1,2,3 |
| Pontiac | Michigan | 1,2,3 |
| Port Huron | Michigan | 1,2,3 |
| Portage | Michigan | 1,2,3 |
| Redford Township | Michigan | 1,2,3 |
| Romulus | Michigan | 1 |
| Roseville | Michigan | 1,2,3 |
| Royal Oak | Michigan | 1,2,3 |
| Saginaw | Michigan | 1,2,3 |

| | | |
|---|---|---|
| Saginaw Township | Michigan | 1,2,3 |
| Shelby Township | Michigan | 1,2,3 |
| Southfield | Michigan | 1,2,3 |
| Southgate | Michigan | 1,2,3 |
| St. Clair Shores | Michigan | 1,2,3 |
| Sterling Heights | Michigan | 1,2,3 |
| Taylor | Michigan | 1,2,3 |
| Troy | Michigan | 1,2,3 |
| Van Buren Township | Michigan | 1 |
| Warren | Michigan | 3 |
| Waterford Township | Michigan | 2,3 |
| West Bloomfield Township | Michigan | 1,2,3 |
| Westland | Michigan | 1,2,3 |
| White Lake Township | Michigan | 1,2,3 |
| Wyandotte | Michigan | 1,2 |
| Wyoming | Michigan | 1,2,3 |
| Apple Valley | Minnesota | 1,2,3 |
| Bloomington | Minnesota | 1,2,3 |
| Brooklyn Center | Minnesota | 1,2,3 |
| Brooklyn Park | Minnesota | 1,2,3 |
| Burnsville | Minnesota | 1,2,3 |
| Coon Rapids | Minnesota | 1 |
| Cottage Grove | Minnesota | 1,2,3 |
| Duluth | Minnesota | 1,2,3 |
| Eagan | Minnesota | 1,2,3 |
| Eden Prairie | Minnesota | 1,2,3 |
| Edina | Minnesota | 1,2,3 |
| Inver Grove Heights | Minnesota | 1,2,3 |
| Lakeville | Minnesota | 1,2,3 |
| Mankato | Minnesota | 1 |
| Maple Grove | Minnesota | 1,2,3 |
| Minneapolis | Minnesota | 1,2,3 |
| Minnetonka | Minnesota | 1,2,3 |
| Moorhead | Minnesota | 1,2,3 |
| Oakdale | Minnesota | 1,2,3 |
| Plymouth | Minnesota | 1,2,3 |
| Richfield | Minnesota | 1,2,3 |
| Rochester | Minnesota | 1,2,3 |
| Roseville | Minnesota | 1,2,3 |
| St. Cloud | Minnesota | 2,3 |
| St. Louis Park | Minnesota | 1,2,3 |
| St. Paul | Minnesota | 1,2,3 |
| White Bear Lake | Minnesota | 2,3 |
| Winona | Minnesota | 1,2,3 |
| Woodbury | Minnesota | 1,2,3 |

| | | |
|---|---|---|
| Biloxi | Mississippi | 1 |
| Columbus | Mississippi | 2,3 |
| Greenville | Mississippi | 2 |
| Gulfport | Mississippi | 1,2,3 |
| Hattiesburg | Mississippi | 1,2,3 |
| Jackson | Mississippi | 3 |
| Meridian | Mississippi | 1,2,3 |
| Pascagoula | Mississippi | 1,2,3 |
| Southaven | Mississippi | 3 |
| Tupelo | Mississippi | 1,2,3 |
| Blue Springs | Mississippi | 3 |
| Cape Girardeau | Missouri | 1,2,3 |
| Chesterfield | Missouri | 1 |
| Columbia | Missouri | 1,2,3 |
| Florissant | Missouri | 1,2,3 |
| Gladstone | Missouri | 1,2,3 |
| Independence | Missouri | 1,2,3 |
| Jefferson City | Missouri | 1,2,3 |
| Joplin | Missouri | 1,2,3 |
| Kansas City | Missouri | 1,2,3 |
| Kirkwood | Missouri | 1,2,3 |
| Lee's Summit | Missouri | 1,2,3 |
| Liberty | Missouri | 1 |
| Maryland Heights | Missouri | 2,3 |
| O'Fallon | Missouri | 1 |
| Raytown | Missouri | 1 |
| Springfield | Missouri | 1,2,3 |
| St. Charles | Missouri | 1,2,3 |
| St. Joseph | Missouri | 1,2,3 |
| St. Louis | Missouri | 1,2,3 |
| St. Peters | Missouri | 1 |
| University City | Missouri | 1,2,3 |
| Billings | Montana | 3 |
| Bozeman | Montana | 3 |
| Great Falls | Montana | 1,2,3 |
| Bellevue | Nebraska | 1 |
| Fremont | Nebraska | 1,2,3 |
| Grand Island | Nebraska | 1,2,3 |
| Kearney | Nebraska | 1,2,3 |
| Lincoln | Nebraska | 1,2,3 |
| Omaha | Nebraska | 1,2,3 |
| Henderson | Nevada | 1,3 |
| North Las Vegas | Nevada | 1,2,3 |
| Reno | Nevada | 1 |
| Sparks | Nevada | 1,2,3 |

| | | |
|---|---|---|
| Derry | New Hampshire | 1,2,3 |
| Manchester | New Hampshire | 1,2,3 |
| Rochester | New Hampshire | 1,2,3 |
| Bayonne | New Jersey | 1,2,3 |
| Belleville | New Jersey | 1,2,3 |
| Bergenfield | New Jersey | 1,2,3 |
| Berkeley Township | New Jersey | 1,2,3 |
| Bernards Township | New Jef | 3 |
| Bloomfield | New Jersey | 1,2,3 |
| Brick Township | New Jersey | 1,2,3 |
| Bridgewater Township | New Jersey | 1,2,3 |
| Camden | New Jersey | 1,2,3 |
| Cherry Hill Township | New Jersey | 1,2,3 |
| Clifton | New Jersey | 1,2,3 |
| Deptford Township | New Jersey | 1,2,3 |
| Dover Township | New Jersey | 1,2,3 |
| East Brunswick Township | New Jersey | 1,2,3 |
| East Orange | New Jersey | 1,2,3 |
| East Windsor Township | New Jersey | 3 |
| Edison Township | New Jersey | 1,3 |
| Egg Harbor Township | New Jersey | 1,2,3 |
| Elizabeth | New Jersey | 1,2,3 |
| Englewood | New Jersey | 1,2,3 |
| Evesham Township | New Jersey | 1,2,3 |
| Ewing Township | New Jersey | 1,2,3 |
| Fair Lawn | New Jersey | 1,2,3 |
| Fort Lee | New Jersey | 1,2,3 |
| Franklin Township (Somerset County) | New Jersey | 1,2,3 |
| Freehold Township | New Jersey | 1,2,3 |
| Galloway Township | New Jersey | 1,2,3 |
| Garfield | New Jersey | 1,2,3 |
| Gloucester Township | New Jersey | 1,2,3 |
| Hackensack | New Jersey | 1,2,3 |
| Hamilton Township | New Jersey | 2 |
| Hillsborough Township | New Jersey | 1,2,3 |
| Hoboken | New Jersey | 1,2,3 |
| Howell Township | New Jersey | 1,2,3 |
| Irvington | New Jersey | 1,2,3 |
| Jackson Township | New Jersey | 1,2,3 |
| Jersey City | New Jersey | 1,2,3 |
| Kearny | New Jersey | 1,2,3 |
| Lacey Township | New Jersey | 1,2,3 |
| Lakewood Township | New Jersey | 1,2,3 |
| Lawrence Township | New Jersey | 1,2,3 |
| Linden | New Jersey | 1,2,3 |

| | | |
|---|---|---|
| Livingston Township | New Jersey | 1,2,3 |
| Long Branch | New Jersey | 1,2,3 |
| Manalapan Township | New Jersey | 1,2,3 |
| Manchester Township | New Jersey | 1,2,3 |
| Marlboro Township | New Jersey | 1,2,3 |
| Middletown Township | New Jersey | 1,2,3 |
| Millville | New Jersey | 1,2,3 |
| Monroe Township (Gloucester County) | New Jersey | 1,2,3 |
| Monroe Township (Middlesex County) | New Jersey | 1,2,3 |
| Montclair | New Jersey | 1,2,3 |
| Mount Laurel Township | New Jersey | 1,2,3 |
| Neptune Township | New Jersey | 1,2,3 |
| New Brunswick | New Jersey | 1,2,3 |
| Newark | New Jersey | 1,2,3 |
| North Bergen Township | New Jersey | 1,2 |
| North Brunswick Township | New Jersey | 1,2 |
| Nutley Township | New Jersey | 1,2,3 |
| Ocean Township (Monmouth County) | New Jersey | 1,2,3 |
| Old Bridge Township | New Jersey | 1,2 |
| Orange | New Jersey | 1,2,3 |
| Paramus | New Jersey | 1,2,3 |
| Parsippany-Troy Hills Township | New Jersey | 1,2,3 |
| Passaic | New Jersey | 1,2,3 |
| Paterson | New Jersey | 1,2,3 |
| Pemberton Township | New Jersey | 1,2,3 |
| Pennsauken Township | New Jersey | 1,2,3 |
| Perth Amboy | New Jersey | 1,2,3 |
| Piscataway Township | New Jersey | 1,2,3 |
| Plainfield | New Jersey | 1,2,3 |
| Rahway | New Jersey | 1,2,3 |
| Randolph Township | New Jersey | 3 |
| Ridgewood | New Jersey | 1,2,3 |
| Sayreville | New Jersey | 1,2,3 |
| South Brunswick Township | New Jersey | 1,2,3 |
| Teaneck Township | New Jersey | 1,2,3 |
| Trenton | New Jersey | 1,2,3 |
| Union City | New Jersey | 1,2,3 |
| Union Township | New Jersey | 1,2,3 |
| Vernon Township | New Jersey | 3 |
| Vineland | New Jersey | 1,2,3 |
| Voorhees Township | New Jersey | 1,2,3 |
| Wall Township | New Jersey | 1,2,3 |
| Washington Township (Gloucester County) | New Jersey | 1,2,3 |
| Wayne Township | New Jersey | 1,2,3 |

| | | |
|---|---|---|
| West Milford Township | New Jersey | 1,2,3 |
| West New York | New Jersey | 1,2,3 |
| West Orange | New Jersey | 1,2,3 |
| Westfield | New Jersey | 1,2,3 |
| Willingboro Township | New Jersey | 1,2,3 |
| Winslow Township | New Jersey | 1,2,3 |
| Woodbridge Township | New Jersey | 1,2,3 |
| Alamogordo | New Mexico | 1,2,3 |
| Albuquerque | New Mexico | 1,2,3 |
| Carlsbad | New Mexico | 1 |
| Clovis | New Mexico | 1,2,3 |
| Hobbs | New Mexico | 3 |
| Rio Rancho | New Mexico | 1,2,3 |
| Roswell | New Mexico | 2,3 |
| Albany | New York | 1,2 |
| Amherst Town | New York | 1,2,3 |
| Auburn | New York | 1,2,3 |
| Bethlehem Town | New York | 3 |
| Brighton Town | New York | 2,3 |
| Buffalo | New York | 1,2 |
| Carmel Town | New York | 1,2,3 |
| Clarkstown Town | New York | 1,2,3 |
| Clay Town | New York | 1,2,3 |
| Colonie Town | New York | 1,2,3 |
| East Fishkill Town | New York | 3 |
| Freeport Village | New York | 3 |
| Gates Town | New York | 1,2,3 |
| Greece Town | New York | 1 |
| Greenburgh Town | New York | 1 |
| Hempstead Village | New York | 3 |
| Irondequoit Town | New York | 1,2,3 |
| Jamestown | New York | 1 |
| Long Beach | New York | 2 |
| Mount Pleasant Town | New York | 1,2 |
| New Rochelle | New York | 2,3 |
| Newburgh | New York | 1,2,3 |
| Newburgh Town | New York | 3 |
| Niagara Falls | New York | 2,3 |
| North Tonawanda | New York | 1,2,3 |
| Orangetown Town | New York | 1 |
| Poughkeepsie Town | New York | 1,3 |
| Ramapo Town | New York | 2 |
| Riverhead Town | New York | 1,2 |
| Rochester | New York | 1,2,3 |
| Rockville Centre Village | New York | 1 |

| | | |
|---|---|---|
| Rome | New York | 1,2,3 |
| Rotterdam Town | New York | 1,2 |
| Schenectady | New York | 2 |
| Syracuse | New York | 1,2,3 |
| Utica | New York | 1,2 |
| Vestal Town | New York | 1,2 |
| Wallkill Town | New York | 1 |
| Watertown | New York | 1,2,3 |
| Webster Town and Village | New York | 1,2,3 |
| West Seneca Town | New York | 1,2,3 |
| White Plains | New York | 1,2,3 |
| Yonkers | New York | 1,2,3 |
| Asheville | North Carolina | 1,2,3 |
| Burlington | North Carolina | 1,2,3 |
| Cary | North Carolina | 1,2,3 |
| Chapel Hill | North Carolina | 1,2,3 |
| Charlotte-Mecklenburg | North Carolina | 1,2,3 |
| Concord | North Carolina | 3 |
| Durham | North Carolina | 1,2,3 |
| Fayetteville | North Carolina | 2 |
| Gastonia | North Carolina | 1,2 |
| Goldsboro | North Carolina | 1 |
| Greensboro | North Carolina | 1,3 |
| Greenville | North Carolina | 1,2,3 |
| Hickory | North Carolina | 1,2,3 |
| High Point | North Carolina | 1,2,3 |
| Huntersville | North Carolina | 3 |
| Jacksonville | North Carolina | 1 |
| Kannapolis | North Carolina | 2,3 |
| Raleigh | North Carolina | 1,2,3 |
| Rocky Mount | North Carolina | 1,2,3 |
| Salisbury | North Carolina | 1,2,3 |
| Wilmington | North Carolina | 1,2,3 |
| Wilson | North Carolina | 1,2,3 |
| Winston-Salem | North Carolina | 1,3 |
| Bismarck | North Dakota | 1,2,3 |
| Fargo | North Dakota | 1,2,3 |
| Grand Forks | North Dakota | 1,2,3 |
| Minot | North Dakota | 1,2,3 |
| Barberton | Ohio | 1,3 |
| Beavercreek | Ohio | 1,2,3 |
| Bowling Green | Ohio | 1,2,3 |
| Cincinnati | Ohio | 2,3 |
| Cleveland | Ohio | 1,2,3 |
| Cleveland Heights | Ohio | 1,2,3 |

| | | |
|---|---|---|
| Columbus | Ohio | 1,2,3 |
| Cuyahoga Falls | Ohio | 1,2,3 |
| Dayton | Ohio | 1,2,3 |
| Delaware | Ohio | 2,3 |
| Delhi Township | Ohio | 1,2,3 |
| Dublin | Ohio | 1,2,3 |
| Euclid | Ohio | 1,2,3 |
| Fairborn | Ohio | 1,2,3 |
| Fairfield | Ohio | 1,2 |
| Gahanna | Ohio | 1,2 |
| Grove City | Ohio | 2 |
| Hamilton | Ohio | 1,2,3 |
| Huber Heights | Ohio | 1,2,3 |
| Kent | Ohio | 1,2 |
| Kettering | Ohio | 1,2,3 |
| Lakewood | Ohio | 1,2,3 |
| Lancaster | Ohio | 3 |
| Lima | Ohio | 1,2,3 |
| Lorain | Ohio | 1,2,3 |
| Mansfield | Ohio | 1,2,3 |
| Marion | Ohio | 3 |
| Mentor | Ohio | 2,3 |
| Miami Township | Ohio | 1,2,3 |
| Middletown | Ohio | 1,2,3 |
| North Royalton | Ohio | 3 |
| Parma | Ohio | 3 |
| Perry Township (Stark County) | Ohio | 1,2,3 |
| Reynoldsburg | Ohio | 1 |
| Sandusky | Ohio | 1,2,3 |
| Shaker Heights | Ohio | 1,2,3 |
| Springfield | Ohio | 1,2,3 |
| Springfield Township (Hamilton County) | Ohio | 1,2,3 |
| Stow | Ohio | 1,2,3 |
| Strongsville | Ohio | 1,2 |
| Sylvania Township | Ohio | 2,3 |
| Toledo | Ohio | 1 |
| Trotwood | Ohio | 1 |
| Upper Arlington | Ohio | 1,2 |
| Warren | Ohio | 3 |
| West Chester Township | Ohio | 2,3 |
| Westerville | Ohio | 3 |
| Westlake | Ohio | 1 |
| Xenia | Ohio | 1,2 |
| Youngstown | Ohio | 1,2,3 |

| | | |
|---|---|---|
| Bartlesville | Oklahoma | 1,2,3 |
| Broken Arrow | Oklahoma | 1,2,3 |
| Edmond | Oklahoma | 1,2,3 |
| Enid | Oklahoma | 1,2,3 |
| Lawton | Oklahoma | 1,2,3 |
| Midwest City | Oklahoma | 1,2,3 |
| Moore | Oklahoma | 1,2,3 |
| Muskogee | Oklahoma | 1,2,3 |
| Norman | Oklahoma | 1,2,3 |
| Oklahoma City | Oklahoma | 1,2,3 |
| Ponca City | Oklahoma | 1,2,3 |
| Shawnee | Oklahoma | 1,2,3 |
| Stillwater | Oklahoma | 1,2,3 |
| Tulsa | Oklahoma | 1,2,3 |
| Albany | Oregon | 1,2,3 |
| Beaverton | Oregon | 1,2,3 |
| Bend | Oregon | 1,2,3 |
| Corvallis | Oregon | 1,2 |
| Eugene | Oregon | 1,2,3 |
| Gresham | Oregon | 1,2,3 |
| Hillsboro | Oregon | 3 |
| Keizer | Oregon | 1,2,3 |
| Lake Oswego | Oregon | 1,2,3 |
| McMinnville | Oregon | 1,2,3 |
| Medford | Oregon | 1,2,3 |
| Oregon City | Oregon | 2,3 |
| Portland | Oregon | 1,2,3 |
| Salem | Oregon | 1,2,3 |
| Springfield | Oregon | 1,2,3 |
| Tigard | Oregon | 1,2,3 |
| Abington Township | Pennsylvania | 1,2,3 |
| Allentown | Pennsylvania | 1,2,3 |
| Altoona | Pennsylvania | 1,2,3 |
| Bensalem Township | Pennsylvania | 3 |
| Bethel Park | Pennsylvania | 3 |
| Bethlehem | Pennsylvania | 1,2 |
| Cheltenham Township | Pennsylvania | 1,2,3 |
| Chester | Pennsylvania | 1 |
| Easton | Pennsylvania | 1 |
| Erie | Pennsylvania | 1,2,3 |
| Falls Township (Bucks County) | Pennsylvania | 3 |
| Haverford Township | Pennsylvania | 1,2,3 |
| Johnstown | Pennsylvania | 1,2,3 |
| Lancaster | Pennsylvania | 2,3 |
| Lower Makefield Township | Pennsylvania | 1,2,3 |

| | | |
|---|---|---|
| Lower Merion Township | Pennsylvania | 1,2,3 |
| Lower Paxton Township | Pennsylvania | 1 |
| McCandless | Pennsylvania | 1 |
| Middletown Township | Pennsylvania | 1,2,3 |
| Millcreek Township | Pennsylvania | 1,2,3 |
| Monroeville | Pennsylvania | 1,2,3 |
| Mount Lebanon | Pennsylvania | 1,2,3 |
| New Castle | Pennsylvania | 3 |
| Norristown | Pennsylvania | 1,2,3 |
| North Huntingdon Township | Pennsylvania | 1,2 |
| Northampton Township | Pennsylvania | 1,2,3 |
| Northern York Regional | Pennsylvania | 1,2,3 |
| Penn Hills | Pennsylvania | 1,2,3 |
| Pittsburgh | Pennsylvania | 1,2,3 |
| Pocono Mountain | Pennsylvania | 3 |
| Reading | Pennsylvania | 1,2,3 |
| Ridley Township | Pennsylvania | 1,2,3 |
| Ross Township | Pennsylvania | 1 |
| Shaler Township | Pennsylvania | 1,2,3 |
| State College | Pennsylvania | 1,2,3 |
| Stroud Area Regional | Pennsylvania | 2,3 |
| Tredyffrin Township | Pennsylvania | 1,2,3 |
| Upper Darby Township | Pennsylvania | 1,2,3 |
| Upper Merion Township | Pennsylvania | 1,2,3 |
| Upper Moreland Township | Pennsylvania | 3 |
| Warminster Township | Pennsylvania | 1,2,3 |
| Whitehall Township | Pennsylvania | 3 |
| York Area Regional | Pennsylvania | 2,3 |
| Coventry | Rhode Island | 1,2,3 |
| Cranston | Rhode Island | 1,2,3 |
| Cumberland | Rhode Island | 1,2,3 |
| East Providence | Rhode Island | 1,2,3 |
| Johnston | Rhode Island | 1,2,3 |
| Newport | Rhode Island | 1,2,3 |
| North Kingstown | Rhode Island | 1,2,3 |
| North Providence | Rhode Island | 1,2,3 |
| Pawtucket | Rhode Island | 1,2,3 |
| Providence | Rhode Island | 1,2,3 |
| South Kingstown | Rhode Island | 1,2,3 |
| Warwick | Rhode Island | 1,2,3 |
| West Warwick | Rhode Island | 1,2,3 |
| Woonsocket | Rhode Island | 1,2,3 |
| Aiken | South Carolina | 3 |
| Columbia | South Carolina | 2,3 |
| Florence | South Carolina | 1,2,3 |

| | | |
|---|---|---|
| Greenville | South Carolina | 1 |
| Goose Creek | South Carolina | 3 |
| Spartanburg | South Carolina | 1,2,3 |
| Aberdeen | South Dakota | 1,2 |
| Rapid City | South Dakota | 1,2,3 |
| Sioux Falls | South Dakota | 1,2,3 |
| Bartlett | Tennessee | 2 |
| Bristol | Tennessee | 2,3 |
| Chattanooga | Tennessee | 1,2,3 |
| Clarksville | Tennessee | 1,2,3 |
| Cleveland | Tennessee | 1,2,3 |
| Collierville | Tennessee | 2,3 |
| Columbia | Tennessee | 1,2,3 |
| Cookeville | Tennessee | 1,2 |
| Franklin | Tennessee | 3 |
| Germantown | Tennessee | 1,2,3 |
| Hendersonville | Tennessee | 1,2,3 |
| Jackson | Tennessee | 1,2,3 |
| Johnson City | Tennessee | 1,2,3 |
| Kingsport | Tennessee | 1,2,3 |
| Knoxville | Tennessee | 1,2,3 |
| Memphis | Tennessee | 1,3 |
| Morristown | Tennessee | 2,3 |
| Murfreesboro | Tennessee | 1,2,3 |
| Nashville | Tennessee | 1,2,3 |
| Oak Ridge | Tennessee | 2,3 |
| Smyrna | Tennessee | 2,3 |
| Abilene | Texas | 1,2,3 |
| Allen | Texas | 1,2,3 |
| Amarillo | Texas | 1,2,3 |
| Arlington | Texas | 1,2,3 |
| Austin | Texas | 1,2,3 |
| Baytown | Texas | 1,2,3 |
| Beaumont | Texas | 1,2,3 |
| Bedford | Texas | 1,2,3 |
| Big Spring | Texas | 3 |
| Brownsville | Texas | 1,2,3 |
| Bryan | Texas | 1,2,3 |
| Carrollton | Texas | 1,2,3 |
| Cedar Hill | Texas | 1,2,3 |
| Cedar Park | Texas | 2,3 |
| Cleburne | Texas | 1 |
| College Station | Texas | 1,2,3 |
| Conroe | Texas | 1,2,3 |
| Coppell | Texas | 1 |

| | | |
|---|---|---|
| Copperas Cove | Texas | 1,2,3 |
| Corpus Christi | Texas | 1,2,3 |
| Corsicana | Texas | 2,3 |
| Deer Park | Texas | 1,2,3 |
| Del Rio | Texas | 1,2,3 |
| Denton | Texas | 1,2,3 |
| DeSoto | Texas | 1,2,3 |
| Duncanville | Texas | 1,2,3 |
| Eagle Pass | Texas | 1 |
| Edinburg | Texas | 1,2,3 |
| El Paso | Texas | 1,2,3 |
| Euless | Texas | 1,2,3 |
| Farmers Branch | Texas | 1,2,3 |
| Flower Mound | Texas | 1,2 |
| Fort Worth | Texas | 1,2,3 |
| Friendswood | Texas | 1,2,3 |
| Frisco | Texas | 3 |
| Garland | Texas | 1,2,3 |
| Georgetown | Texas | 1,2,3 |
| Grand Prairie | Texas | 1,2,3 |
| Grapevine | Texas | 1,2,3 |
| Greenville | Texas | 1,2,3 |
| Haltom City | Texas | 2,3 |
| Harlingen | Texas | 1,2,3 |
| Huntsville | Texas | 1,2,3 |
| Hurst | Texas | 1,2,3 |
| Irving | Texas | 1,2,3 |
| Keller | Texas | 3 |
| Killeen | Texas | 1,2,3 |
| Kingsville | Texas | 1,2,3 |
| La Porte | Texas | 2,3 |
| Lake Jackson | Texas | 1,2,3 |
| Lancaster | Texas | 1,3 |
| Laredo | Texas | 1,2,3 |
| League City | Texas | 1,2,3 |
| Lewisville | Texas | 2,3 |
| Longview | Texas | 1,2,3 |
| Lubbock | Texas | 1,2,3 |
| Lufkin | Texas | 1,2,3 |
| Mansfield | Texas | 3 |
| Marshall | Texas | 2,3 |
| McAllen | Texas | 1,2,3 |
| McKinney | Texas | 3 |
| Mesquite | Texas | 1,2,3 |
| Midland | Texas | 1,2,3 |

| | | |
|---|---|---|
| Missouri City | Texas | 1,2,3 |
| Nacogdoches | Texas | 1,2,3 |
| New Braunfels | Texas | 1,2,3 |
| North Richland Hills | Texas | 1,2,3 |
| Odessa | Texas | 1,2,3 |
| Paris | Texas | 1,2,3 |
| Pasadena | Texas | 1,2,3 |
| Pearland | Texas | 1,2,3 |
| Pharr | Texas | 1,2,3 |
| Plano | Texas | 1,2,3 |
| Port Arthur | Texas | 1,2,3 |
| Richardson | Texas | 1,2,3 |
| Rosenberg | Texas | 1,2,3 |
| Round Rock | Texas | 1,2,3 |
| Rowlett | Texas | 1,2,3 |
| San Angelo | Texas | 1,2,3 |
| San Marcos | Texas | 1,2,3 |
| Sherman | Texas | 1,2,3 |
| Socorro | Texas | 1,2,3 |
| Sugar Land | Texas | 2,3 |
| Temple | Texas | 1 |
| Texarkana | Texas | 1,2,3 |
| Texas City | Texas | 1,2,3 |
| The Colony | Texas | 1,2 |
| Victoria | Texas | 1,2,3 |
| Waco | Texas | 1,2,3 |
| Weslaco | Texas | 1,2,3 |
| Wichita Falls | Texas | 1,2,3 |
| Bountiful | Utah | 1,2,3 |
| Clearfield | Utah | 1,2,3 |
| Layton | Utah | 2,3 |
| Logan | Utah | 3 |
| Midvale | Utah | 1,2,3 |
| Murray | Utah | 2,3 |
| Ogden | Utah | 1,2,3 |
| Orem | Utah | 1,2,3 |
| Pleasant Grove/Lindon | Utah | 2 |
| Provo | Utah | 1,2,3 |
| Roy | Utah | 1,2,3 |
| Salt Lake City | Utah | 1,2,3 |
| Sandy | Utah | 1,2,3 |
| West Jordan | Utah | 1,2,3 |
| West Valley | Utah | 1,2 |
| Burlington | Vermont | 1,2,3 |
| Blacksburg | Virginia | 1,2,3 |

| | | |
|---|---|---|
| Charlottesville | Virginia | 1,2 |
| Hampton | Virginia | 3 |
| Harrisonburg | Virginia | 1,2,3 |
| Leesburg | Virginia | 2,3 |
| Lynchburg | Virginia | 1,2,3 |
| Manassas | Virginia | 1,2 |
| Newport News | Virginia | 1,2,3 |
| Norfolk | Virginia | 2,3 |
| Petersburg | Virginia | 2,3 |
| Portsmouth | Virginia | 3 |
| Richmond | Virginia | 1,2,3 |
| Salem | Virginia | 2,3 |
| Suffolk | Virginia | 1,2,3 |
| Virginia Beach | Virginia | 1,2,3 |
| Bellevue | Washington | 1,2,3 |
| Bellingham | Washington | 1,2,3 |
| Bothell | Washington | 3 |
| Bremerton | Washington | 1,2,3 |
| Burien | Washington | 3 |
| Des Moines | Washington | 2,3 |
| Edmonds | Washington | 2,3 |
| Everett | Washington | 1,2,3 |
| Federal Way | Washington | 1,2,3 |
| Kennewick | Washington | 1,2,3 |
| Kent | Washington | 3 |
| Kirkland | Washington | 1,2,3 |
| Lacey | Washington | 1,2,3 |
| Lakewood | Washington | 1,2,3 |
| Longview | Washington | 1,2,3 |
| Lynnwood | Washington | 1,2,3 |
| Mount Vernon | Washington | 2,3 |
| Olympia | Washington | 1,2,3 |
| Pasco | Washington | 1,2,3 |
| Puyallup | Washington | 1,2,3 |
| Redmond | Washington | 1,2,3 |
| Renton | Washington | 1,2,3 |
| Richland | Washington | 1,2,3 |
| SeaTac | Washington | 3 |
| Seattle | Washington | 1,2,3 |
| Spokane | Washington | 1,2,3 |
| Tacoma | Washington | 1,2,3 |
| University Place | Washington | 2,3 |
| Vancouver | Washington | 2 |
| Walla Walla | Washington | 1,2,3 |
| Wenatchee | Washington | 1,2,3 |

| | | |
|---|---|---|
| Yakima | Washington | 1,2,3 |
| Appleton | Wisconsin | 1,2,3 |
| Beloit | Wisconsin | 1,2 |
| Brookfield | Wisconsin | 1,2,3 |
| Eau Claire | Wisconsin | 1,2,3 |
| Fond Du Lac | Wisconsin | 1,2,3 |
| Franklin | Wisconsin | 1,2,3 |
| Green Bay | Wisconsin | 1,2,3 |
| Greenfield | Wisconsin | 1,2,3 |
| Janesville | Wisconsin | 1,2,3 |
| Kenosha | Wisconsin | 1,2 |
| La Crosse | Wisconsin | 1,2,3 |
| Madison | Wisconsin | 1,2,3 |
| Manitowoc | Wisconsin | 1,2,3 |
| Menomonee Falls | Wisconsin | 1,2,3 |
| Milwaukee | Wisconsin | 1,2,3 |
| New Berlin | Wisconsin | 1,2,3 |
| Oak Creek | Wisconsin | 1,2,3 |
| Oshkosh | Wisconsin | 1,2,3 |
| Racine | Wisconsin | 1,2 |
| Sheboygan | Wisconsin | 1,2,3 |
| Superior | Wisconsin | 1,2,3 |
| Waukesha | Wisconsin | 1,2 |
| Wausau | Wisconsin | 1,2,3 |
| Wauwatosa | Wisconsin | 1,2,3 |
| West Allis | Wisconsin | 1,2,3 |
| West Bend | Wisconsin | 1 |
| Casper | Wyoming | 1,2,3 |
| Cheyenne | Wyoming | 1,2,3 |
| Laramie | Wyoming | 1,2,3 |

## Vita

April M. Overman graduated Emerson Preparatory Institute in Washington, D.C. at the age of fifteen. Three years later, she received her Bachelor of Arts (history) from Newcomb College of Tulane University. At the age of twenty-one, she received her Juris Doctor from Tulane University School of Law and entered a lifelong career in law enforcement. While a full-time, commissioned member of the New Orleans Police Department, she returned to graduate school and received her Master of Arts (sociology) from Tulane University. In 2008, she was awarded a Crescent City Doctoral Scholarship from the University of New Orleans to pursue her doctorate degree in urban studies. Toward the end of her doctoral studies, she retired from the New Orleans Police Department at the rank of Police Captain and began teaching for police academies throughout the state of Mississippi.